UNISYS

CTOS®
VT220 Emulator
Operations Guide

Release 2.0

Priced Item

April 1991
Distribution Code SA
Printed in U S America
4161 2706–000

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Product Information Announcement

○ New Release ● Revision ○ Update ○ New Mail Code

Title

CTOS® VT220 Emulator Operations Guide

This Product Information Announcement announces the release of Revision 1 to the *CTOS VT220 Emulator Operations Guide.*

This guide describes installing, configuring, and running the CTOS VT220 Emulator. It discusses the available connection methods and explains the Emulator configuration for each method. This guide also lists the keyboard configurations for VT52, VT100, VT220, and ANSI terminal emulations.

In addition to vast editorial changes, this revision includes information about these new features:

- Support of file transfer functionality using the XModem and Kermit protocols
- Compatibility with CTOS Installation Manager

Copies of Revision 1 are now available. To receive copies of the revision, order 4161 2706–000 through your Unisys representative.

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About This Guide

Purpose

This document is a reference guide for anyone who must install, configure, or run the CTOS® VT220 Emulator.

Scope

This guide describes installing, configuring, and running the CTOS VT220 Emulator. It discusses the available connection methods and explains the Emulator configuration for each method. This guide also lists the keyboard configurations for VT52, VT100, VT220, and ANSI terminal emulations.

Audience

The audience for this guide is anyone who must install, configure, or run the CTOS VT220 Emulator.

Prerequisites

To use this guide, operators should be familiar with using both CTOS and one or more of the VT or ANSI terminals.

How to Use This Guide

Read sections one and two to get an overview of the CTOS VT220 Emulator and its system requirements. Read sections three through five to install, configure, and run the emulator. Read sections six through twelve to learn about configuring the keyboard, doing file transfer, and learning about other useful enhancements to get the most out of this product. The appendices provide you with quick reference material.

Organization

This guide consists of twelve sections and eight appendices:

Section 1. Overview

This section introduces the CTOS VT220 Emulator, reviews the major features of the Emulator, summarizes the tasks you must perform to use the software and identifies the sections in this manual which provide information for those tasks.

Section 2. System Requirements

This section describes the required hardware, software, disk, and memory resources you must have available in order to install and use the CTOS VT220 Emulator software.

Section 3. Software Installation

This section explains how to install the CTOS VT220 Emulator on your CTOS workstation or shared resource processor. It also includes a list of files copied from your product disk and a list of new commands created.

Section 4. Configuring the Emulator

This section explains how to configure the CTOS VT220 Emulator for direct–connect, asynchronous modem line, X.25, or TCP/IP connections.

Section 5. Running the Emulator

This section describes how to run the VT220 Emulator using a direct or modem line, X.25, or TCP/IP connections. This section also provides information on specifying ports for asynchronous modems, on dialing with modems, and on configuring for RS–232, X.25, and TCP/IP connections.

Section 6. Keyboard Configurations

This section describes the functions of the CTOS keyboard during VT52, VT100, VT220, and ANSI emulation.

Section 7. Programming Function and Keypad Keys

This section describes how to program function keys and keypad keys.

Section 8. Composing Keys

This section explains how to use compose sequences and provides a list of valid compose sequences for Multinational Mode.

Section 9. Transmitting Files and Receiving Files

This section explains the file transfer facility and the file receive facility.

Section 10. File Transfer

This section explains the file transfer utility which uses the widely used XModem and Kermit protocols.

Section 11. Printing

This section explains how to print locally from the keyboard or print under control of the host.

Section 12. Status and Path Name Display

This section provides information on the CTOS VT220 Emulator status–display lines and path name display feature.

Appendix A. Status Codes

This appendix provides information about relevant CTOS, X.25, and TCP/IP error codes. This appendix also provides suggestions for correcting errors.

Appendix B. Debugging Features

This appendix explains the CTOS VT220 Emulator's debugging features.

Appendix C. Cabling

This appendix provides information on cables for direct and modem connection, both 25 pin to 25 pin cables and 15 pin to 25 pin cables.

Appendix D. Screen Information

This appendix explains standard ANSI screen characteristics and color.

Appendix E. Escape Sequences

This appendix provides charts that list the CTOS VT220 Emulator escape sequences.

Appendix F. Kermit Protocol

This appendix provides background information on the widely used Kermit protocol.

Appendix G. XModem Protocol

This appendix provides background information on the widely used XModem protocol.

Appendix H. Help

This appendix describes the on–line help facilities.

A glossary and an index follow Appendix H.

Related Product Information

Internal

The following documents are published by Unisys Corporation and can be ordered through Corporate Software and Publication Operations:

CTOS System Software Installation and Configuration Guide

This guide provides step–by–step instructions for installing Standard Software and the appropriate CTOS or BTOS operating system(s). It is similar to the previous BTOS version.

CTOS Executive Reference Manual

This reference manual is organized alphabetically by command name. It includes detailed information about the Standard Software commands and special features of the Executive. This manual and the Executive User's Guide can be used to replace the former BTOS Standard Software Operations Guide.

CTOS System Administration Guide

This guide contains general information about hardware types and system software products. It provides detailed information about installing system services, user configuration files, formatting disks, backing up data, optimizing performance, configuring and customizing operating systems, and troubleshooting common problems.

CTOS Status Codes Reference Manual

This two–volume reference manual has been reorganized and enhanced. Codes are listed numerically. The second volume lists bootstrap errors. Codes from new applications, and Convergent applications have been added.

CTOS Generic Print System (GPS) Using the Font Tool

This manual describes the Font Tool, what the Font Tool is used for, and how to use it.

CTOS Generic Print System (GPS) Using the Print Manager

This manual introduces the Print Manager, which you use to track and monitor printers and print jobs. The Print Manager is installed along with the Generic Print System (GPS).

BTOS II Context Manager II Installation and Configuration Guide

This guide contains introductory, procedural, and reference information about BTOS Context Manager II software.

CTOS TCP/IP Administration Guide

This guide contains information concerning installing and configuring CTOS TCP/IP.

BTOS X.25 Gateway Operations and Programming Guide

This guide contains information concerning installing and configuring the BTOS X.25 Gateway.

External

VT220 Owner's Manual (Digital Equipment Corporation)

This guide provides information on operating and maintaining a VT200 video terminal.

VT220 Programmer Reference Manual (Digital Equipment Corporation)

This guide provides information on accessing VT200 video terminal features.

Notation Conventions

This guide uses the following typographical conventions:

Words that you are to type and that appear on the screen are shown in *italic.*

Parameter names are shown in **bold.**

Keys are shown in uppercase letters, for example, press the GO key.

When two keys are to be used together for an operation, they are hyphenated. For example, SHIFT–RETURN means that while you hold down the SHIFT key, you press the RETURN key.

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Section 1
Overview

This section introduces the CTOS VT220 Emulator, reviews the major features of the Emulator, summarizes the tasks you must perform to use the software and identifies the sections in this manual which provide information for those tasks.

Product Description

The CTOS VT220 Emulator is a software product that allows a CTOS workstation to operate as a VT52, VT100, VT220, or ANSI terminal.

These terminals are general–purpose video display terminals which allow you to interact with application programs running on a host system. Characters typed at the terminal keyboard are sent to the host, and characters sent from the host are displayed on the terminal screen.

The communication between the terminal and the host can take place over RS–232 lines (both direct and modem connections are supported), over X.25 lines or through a TCP/IP network.

The CTOS VT220 Emulator provides file transfer facilities so that files can be uploaded to or downloaded from the remote host.

Features

This release contains the following features:

- Emulation of VT52, VT100, VT220, and ANSI terminals
- Support of file transfer functionality using the XModem and Kermit protocols
- TCP/IP TELNET interconnectivity for end–user applications
- Compatibility with CTOS Installation Manager

- Support for up to 30 programmable function keys, each of which may contain up to 30 characters
- Support for X.25 connectivity
- Support for TCP/IP connectivity, allowing connection of a CTOS workstation through Ethernet or X.25, to a UNIX system or any other TCP/IP host
- Availability of local functions not available on standard VT terminals

Note: *For more information on this product, read the Release Notes on the product disk. You will be prompted to read this file during software installation (see Section 3).*

Tasks and Commands

Use the following list to locate tasks you will perform using the CTOS VT220 Emulator, associated commands, and where you can turn in this guide for more information.

Task	Command	Section
Copy CTOS VT220 Emulator to CTOS workstation	Software Installation or Installation Manager	3
Copy CTOS VT220 Emulator to XE 520 server	XESoftware Installation	3
Copy CTOS VT220 Emulator to XE 530 server	Software Installation or Installation Manager	3
Create or Modify a CTOS Configuration File	Create Configuration File	4
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Task	Command	Section
Run the Emulator over a direct line or modem line	VT Emulator	5
Run the Emulator through an X.25 gateway	X25 VT Emulator	5
Run the Emulator through TCP/IP	TCP/IP VT Emulator	5

Section 2
System Requirements

This section describes the required hardware, software, disk, and memory resources you must have available in order to install and use the CTOS VT220 Emulator software.

Hardware

The VT220 Emulator runs on the following workstations, whether server, cluster, or stand–alone:

- real mode (186 processor)
- protected mode (286 and 386 processors)

The VT220 Emulator can display alphanumeric data on any system.

To use the VT220 Emulator, you must have at least 29 display lines available on your screen.

Notes:

1. *The VT220 Emulator also runs on clusters of XE 520 and XE 530 shared resource processors.*
2. *You do not need graphics facilities such as the "Graphics Slice," "Color Screen," or 132 column display to use the VT220 Emulator on your workstation.*

Connections Supported

The CTOS VT220 Emulator supports the following:

- RS–232 Connections
  - Direct Lines
  - Modem Lines (you need an asynchronous modem)
- X.25 Connections (you need a synchronous modem)
- TCP/IP Sessions (you need an Ethernet LAN module)

RS–232 Connections

If you are using the VT220 Emulator for an RS–232C connection, you will need a modem or direct cable.

Direct Lines

Direct lines connect your CTOS workstation directly to another computer. If you connect your CTOS workstation directly to another computer, you will need a cross–over cable.

Refer to Appendix C for cable details.

Modem Lines

Telephone lines connect your CTOS workstation to another computer over a telephone line by an asynchronous modem. To establish a modem link there must also be a modem on the other side of the connection. Both modems must use compatible speeds and protocols. Modems are available in two types: manual dial and auto dial.

A manual dial modem requires a telephone hand set to be attached to the modem. You use this handset to manually dial the required telephone number.

An auto dial modem does not require a telephone handset to be attached to the modem. An autodial modem will, upon instructions sent from your workstation, automatically dial the required telephone number.

If you connect your CTOS workstation to a modem you will need a 25 pin, RS–232C, modem–connect (male to male) cable.

X.25 Connections

X.25 Lines are similar to modem lines except that the modem used must be a synchronous modem. X.25 is a standard of the CCITT, an international telecommunication organization. The VT220 Emulator does not directly communicate with an X.25 line, but uses the CTOS X.25 Gateway to perform this task.

TCP/IP Sessions

TCP/IP Sessions are used to establish a software connection between computers. TCP/IP is an open systems standard, developed by the United States Department of Defense. TCP/IP Sessions may be established over X.25 lines or through a LAN connection.

Just as the BTOS X.25 Gateway product is required for a connection between a CTOS workstation and an X.25 device, the CTOS TCP/IP product is required for a TCP/IP Session between a CTOS workstation and another device. The socket interface will be used to *talk* to the host over a TCP/IP network.

Software

The following software is *required* to use this product:

Software	**Release Level**
BTOS	8.0 or higher
BTOS II	2.0 or higher
CTOS/VM	2.4 or higher
CTOS/XE	3.0 or higher

The following software *may* be required by this product:

Software	**Release Level**
BTOS X.25 Gateway	9.2 or higher
CTOS TCP/IP	2.0 or higher

Note: *If a gateway is to be used, the gateway must be installed* ***prior*** *to running the VT220 Emulator.*

RAM and Disk Usage

Following is the RAM space and disk usage for the required files for the VT220 Emulator:

Software	K bytes Memory	Disk Sectors
CTOS VT220 Emulator	350	800

Migration and Coexistence

The following lists default information you may need when configuring Context Manager II to run this product. For more information, refer to the *BTOS Context Manager II Installation and Configuration Guide.*

Run file name	[Sys]<ctvt>vt.run
Run file version	6
Runs in protected mode	yes
Minimum memory required	350 KB
Able to be swapped	no
Needs executive screen	no
Loads own font	yes
Loads own keyboard translation table	yes
Directly manipulates the video	yes

BTOS X.25 Gateway (9.2 or higher) is *required* for CTOS VT220 Emulator operation over X.25 networks.

Note: *The VT Emulator R1.0 product will not run with BTOS X.25 Gateway 9.2.*

CTOS TCP/IP (2.0 or higher) is *required* for CTOS VT220 Emulator operation over TCP/IP networks.

Section 3
Software Installation

This section explains how to copy CTOS VT220 Emulator software onto a workstation or a shared resource processor. It includes instructions for using the *Software Installation* command and the *Installation Manager* command. For a more detailed explanation of the *Software Installation* command, consult the *BTOS II Standard Software Operations Guide.* For a more detailed explanation of the *Installation Manager* command, consult the *CTOS Executive Reference Manual.*

Using Software Installation

You can use the *Software Installation* command to copy software from floppy disks onto workstations or shared resource processors.

Workstations

Before you can install the CTOS VT220 Emulator, you must copy the software onto your workstation.

Use the following procedure if you plan to run the CTOS VT220 Emulator on a server or standalone workstation.

1. Power down all cluster workstations.
2. Insert the disk labeled *B25VTE* into floppy disk drive [F0].
3. At the Executive Command line, type *Software Installation* and press the GO key.
4. You will receive a prompt asking you if you want to read or print the Release Notes. The Release Notes contain last–minute information about the product and updates to this guide, if any. Follow the on–screen instructions for reading or printing this file.

5. Follow the prompts that appear on the screen to complete the installation.

   The necessary files are copied, and the commands to run the CTOS VT220 Emulator are created.

6. Remove the disk and keep it in a secure place.
7. Power up all cluster workstations.

Shared Resource Processor Systems

When a shared resource processor is the server, you copy the CTOS VT220 Emulator onto the shared resource processor.

XE–520

Use the following procedure if you plan to run the CTOS VT220 Emulator on an XE–520 system running on BTOS/XE.

Note: *If your XE–520 system runs on CTOS/XE please use the XE–530 procedure located on the following page.*

1. Power down all cluster workstations except the one at which you are working.
2. Insert the disk labeled *B25VTE* into floppy disk drive [F0].
3. At the Executive command line, type *XESoftware Installation* and press the GO key.
4. You will receive a prompt asking you if you want to read or print the Release Notes. The Release Notes contain last–minute information about the product and updates to this guide, if any. Follow the on–screen instructions for reading or printing this file.
5. Follow the prompts that appear on the screen to complete the installation.

   The necessary files are copied, and the commands to run the CTOS VT220 Emulator are created.

6. Remove the disk and keep it in a secure place.
7. Power up all cluster workstations.

XE–530

When software installing on an XE–530 system, you must use the *Software Installation* command and not the *XESoftware Installation* command. Use the following procedure if you plan to run the CTOS VT220 Emulator on an XE–530 system.

Note: *You should use the following procedure if your XE–520 system runs on CTOS/XE.*

1. Power down all cluster workstations except one which you are using.
2. Insert the disk labeled *B25VTE* into floppy disk drive [F0].
3. At the Executive command line, type *Software Installation* and press the RETURN key. The following form appears:

```
Software Installation
  [Cmd File]
  [Files to]
  [Install file]
```

   The default for the `[Cmd File]` parameter is "[Sys]<Sys>Sys.Cmds." The default for the `[Files to]` parameter is "[Sys]<Sys>." You may override these defaults.

   Note: *If you are running the XE–530* ***without*** *Cluster View installed,* ***and*** *you boot your cluster workstation locally, you* ***must*** *override the* `[Cmd File]` *and* `[Files to]` *defaults. (Cluster View is a utility that allows the XE board to be controlled from a cluster workstation.) Specify* [!Sys]<Sys>Sys.Cmds *for the* `[Cmd File]` *parameter and* [!Sys]<Sys> *for the* `[Files to]` *parameter.*

   Press the GO key.

4. You will receive a prompt asking you if you want to read or print the Release Notes. The Release Notes contain last–minute information about the product and updates to this guide, if any. Follow the on–screen instructions for reading or printing this file.
5. Follow the prompts that appear on the screen to complete the installation.

   The necessary files are copied, and the commands to run the CTOS VT220 Emulator are created.

6. Remove the disk and keep it in a secure place.
7. Power up all cluster workstations.

Using Installation Manager

You can use the *Installation Manager* command to copy software from floppy disks onto workstations or shared resource processors. You can also use it to remove software.

Viewing Installed Software

Before you install new software, you can view the software already installed on your workstation or shared resource processor to see if you already have all the software required to use the CTOS VT220 Emulator. Use the following procedure:

1. At the Executive Command line, type *Installation Manager* and press the RETURN key.

   In the Noninteractive parameter:

   Type *no* if you want to be able to select options;

   Or type *yes* if you want the installation to run in noninteractive mode. This means it will not pause for user input, and you will not be able to view or print the Release Notes.

   The default is *no*.

   Note: *Accept the default when copying from disk(s).*

   Press the GO key. The Software Operations menu appears.
2. Select the *Show Installed Software* option to view the software already installed by Installation Manager. Press the GO key.
3. Select *Private Software* to review software installed on the local hard disk;

   Or select *Public Software* to review the software installed publicly on the server. Press the GO key. A list of currently installed software applications appears.
4. Press the CANCEL key twice to return to the Software Operations menu.

Installing Software

Before you can use Installation Manager, you must copy the software onto your workstation or shared resource processor system.

Installation Manager works the same way for workstations and shared resource processors.

1. Power down all workstations except the one at which you are working.
2. Load the disk(s) to be copied.
3. At the Executive Command line, type *Installation Manager* and press the RETURN key.

   In the Noninteractive parameter:

   Type *no* if you want to be able to select options;

   Or type *yes* if you want the installation to run in noninteractive mode. This means it will not pause for user input, and you will not be able to view or print the Release Notes.

   The default is *no*.

   Note: *Accept the default when copying from disk(s).*

   Press the GO key. The Software Operations menu appears.
4. Select the *Install New Software* option. Press the GO key. The Installation Media menu appears.
5. Select the medium you are using to install the CTOS VT220 Emulator:

   Select *Floppy Installation* if copying from disk(s).

   Press the GO key. The Installation menu appears.
6. The Installation menu contains a very important parameter, the *Public Installation* parameter. If you type *yes* for a public installation, the software is installed on the server. This means all the cluster workstations can access the software without using their own disk space. If you type *no*, the software is only installed locally and cannot be accessed by other workstations.

Note: When installing software on shared resource processors, type yes *for Public Installation.*

The Installation menu also contains parameters that allow you to backup and save the currently installed version of software.

Press the GO key to accept the default values (the default for the *Public Installation* parameter is *no*);

Or select the *Examine/Change Defaults* option and press the GO key. Change the installation parameters. Then press the GO key.

The User Name menu appears.

7. Press the GO key to accept the default user name;

   Or enter a new user name. Then press the GO key.

   The Command File form appears.

8. Press the GO key to accept the default Command File name;

   Or enter a new Command File name. Then press the GO key.

9. You will receive a prompt asking you if you want to read or print the Release Notes. The Release Notes contain last–minute information about the product and updates to this guide, if any. Follow the on–screen instructions for reading or printing this file.

10. Follow the prompts that appear on the screen to complete the installation.

    The necessary files are copied, and the commands to run the CTOS VT220 Emulator are created.

11. When the installation is finished, a message appears stating that the installation has completed successfully. Press any key to return to the Executive Command line. Remove the disk and keep it in a secure place.

12. Reboot the workstation (only if you have just installed TCP/IP or X.25 Gateway).

13. Power up all cluster workstations.

Files on the Product Disk

The following files are contained on the disk:

<Unisys>CtVt.Font
<Unisys>CtVtAGP.Font
<Unisys>CtVtB27.Font
<Unisys>FdSys.Version
<Unisys>Kbd.Sys

<Unisys>LetterO.Fks
<Unisys>VtFks1.Form
<Unisys>VtFks2.Form
<Unisys>VtFt1.Form
<Unisys>VtHlp0.Form

<Unisys>VtHlp1.Form
<Unisys>VtHlp2.Form
<Unisys>VtHlp3.Form
<Unisys>VtHlp4.Form
<Unisys>VtHlp5.Form

<Unisys>VtHlp6.Form
<Unisys>VtHlp7.Form
<Unisys>VtHlp8.Form
<Unisys>VtHlp9.Form
<Unisys>VtPKeys1.Form

<Unisys>VtKermit.Form
<Unisys>VtXModem.Form
<Unisys>VtPath.Form
<Unisys>VtTransfer1.Form
<Unisys>VtConfig1.Form

<Unisys>VtConfig2.Form
<Unisys>VtConfig3.Form
<Unisys>VtMsg.Bin
<Unisys>Vt.Colour
<Unisys>Vt.Run

<Unisys>VtComms.Default
<Unisys>X25Config.Default
<Unisys>ReleaseNotes.Doc
<Unisys>ReleaseNotes.Sub
<Sys>Vt.Install.Sub

<Sys>XEInstall.Sub
<Sys>Install.Cmds
<Sys>Install.Ctrl
<Sys>Install.Jcl
<Sys>Install.Sub

Files Copied to Hard Disk

The following files are copied to your hard disk:

File Name	Description
CtVt.Font	The font file for all workstations which contain a 186, 286, or 386 processor
CtVtAGP.Font	The font file for AGP graphics model
CtVtB27.Font	The font file for B27 workstations

File Name	Description
Kbd.Sys	The Keyboard Definition file
LetterO.Fks	A sample Function Key definition file for the OFIS MANAGER product
Vt.Colour	Default Color Definition file
Vt.Run	The VT220 Emulator run file
VtComms.Default	A sample comms channel configuration file
VTConfig.*username*	This file is created as required
VtMsg.Bin	A binary message file
X25Config.Default	A sample X.25 configuration file
VT*.Form	The various forms used by the emulator

Commands Created

The following commands are created during software installation:

Command	Description
VT Emulator	For a Direct/Modem RS–232 Connection Run file: [Sys]<CtVt>Vt.Run Case: 00
X25 VT Emulator	To run over an X.25 Network Run file: <CtVt>Vt.Run Case: 01
TCP/IP VT Emulator	To run over a TCP/IP Network Run file: <CtVt>Vt.Run Case: 02

Removing the CTOS VT220 Emulator From Your System

You can permanently remove software from your system to allocate space for other software or to use your copy of the CTOS VT220 Emulator on another system without infringing on copyright or license agreements. Depending on your operating system and hardware, there are several ways to remove your software.

Using Installation Manager to Remove Files and Commands

You can use the Installation Manager command to remove software that was installed by Installation Manager. Use the following procedure to remove software:

1. At the Executive Command line, type *Installation Manager* and press the GO key. The Software Operations menu appears.
2. Select the *Remove Software* option and press the GO key.
3. Select either *Public Software* or *Private Software* and press the GO key. A list of currently installed software applications appears.
4. Select the software package you wish to remove and press the GO key.

   Installation Manager deletes all related files and removes the associated commands.

Using the Delete Command to Remove Files

You can use the Delete command to remove all product related files from your system.

1. At the Executive command line, type *Delete* and press the return key. The following form appears:

```
Delete
  File list
  [Confirm each?]
```

2. Enter *<CtVt>** on the first parameter line, and press the GO key.

Note: *Use the Command File Editor to remove the "VT Emulator," "X25 VT Emulator," and "TCP/IP VT Emulator" commands.*

Section 4
Configuring the Emulator

This section explains how to configure the CTOS VT220 Emulator for direct–connect, modem line, TCP/IP, or X.25 connections.

Direct and Modem Lines

The CTOS VT220 Emulator requires a CTOS communication configuration file. **VtComms.Default** is used by default if no user–specific configuration file is found.

A user–specific configuration file is defined by adding your sign–on user name to the prefix **<CtVt>VtComms**. For example, a CTOS user signing–on as Roberta can define a user–specific configuration file called **<CtVt>VtComms.Roberta**.

To modify the default configuration file or to create a user–specific configuration file:

1. Type *Create Configuration File* at the executive command line and press the RETURN key. The following form is displayed:

```
Create Configuration File
  Configuration File Name
  Device Type
```

2. Type *[Sys]<CtVt>VtComms.Default* as the **Configuration File Name** and press the RETURN key.
3. Type *C* (comms) as the **Device Type** and press the GO key.

A form is displayed for you to modify, if necessary. The possible values for each entry are displayed with the form.

The following example is the **VtComms.Default** file:

```
Data Bits:                    8
Parity:                       None
Baud Rate:                    9600
Stop Bits:                    1
Transmit TimeOut:             1
Receive TimeOut:              1
Line Control:                 CTS
CR/LF Mapping:                Binary
New Line Mapping:             Binary
EOF Byte:                     None
```

The parameters in this example tells the CTOS workstation that the communication port has the following characteristics:

- Data is transmitted in 8 bit characters, followed by one stop bit and no parity bit, at a transmission speed of 9600 Baud.
- The port contains binary mapping modes indicating that CR/LF and New Line characters should not be changed.
- The port provides a line protocol choice defined as Xon or Xoff. This protocol allows the receiving computer to transmit an Xoff charater (DC3, ASCII 13h), if it is not ready to receive additional text. The computer will send an Xon character (DC1, ASCII 11h) as soon as the computer is ready to receive more text. If you run in direct mode, the protocol options should be used to avoid loss of characters.

Note: *When using XModem for file transfer, do* ***not*** *use Xon or Xoff.*

The communication port configuration on the CTOS workstation must match the configuration of the receiving computer with respect to the transmission speed, data bits, stop bits, and parity. Please consult the administrator of the receiving computer to determine the values you need for the CTOS workstation.

X.25 Gateway

If you wish to use the CTOS VT220 Emulator over the X.25 Gateway, you must install the X.25 Gateway software before you run the CTOS VT220 Emulator.

For information about installing the X.25 Gateway, see the *BTOS X.25 Gateway Operations and Programming Guide.*

After installation of the X.25 Gateway, you must configure an X.25 configuration file for the VT220 Emulator. This file must reside in the <CtVt> directory and must be called **[Sys]<CtVt>X25Config.xxxx** where **xxxx** is a suffix of your choice.

The suffix is used in the main CTOS VT220 Emulator configuration screen to indicate which configuration file is to be used for this session. The default suffix used is "Default".

To create or modify the X.25 configuration file from CTOS:

1. Type *Configure X.25* at the executive command line and press the RETURN key. You will be prompted for the configuration filename.
2. Type *[Sys]<CtVt>X25Config.xxxx*, where *xxxx* is your chosen suffix and press the GO key. The following form appears:

```
X.25 Parameters
  [Node Name]
  [Disable Transmit Buffering?]                Yes
  [Initiate of Accept (default = accept)]      Initiate
  [Local or End-To-End (default = local)]      Local
  [Read timeout (default = forever)]           1
  [Called Address]                             XXXXXXX
  [Reverse Charging?]
  [Call Data]
  [Low Port (default = 0)]
  [High Port (default = 99)]
  [Notify Timeout (default = forever)]         1
  [Max Packet Size (default = 128)]
```

The parameters in this form must be filled in as shown for the X.25 VT220 Emulator interface to function properly.

You must also enter the **[Called Address]** parameter with the X.25 address of the remote computer. The other parameters may vary from site to site.

TCP/IP

If you wish to use the CTOS VT220 Emulator over TCP/IP, you must install the TCP/IP software before you run the CTOS VT220 Emulator.

To run the Emulator using the TCP/IP VT220 Emulator command, the TCP/IP Request Codes should be merged with the Request.Sys file of the local workstation. TCP/IP 2.0 will have a separate submit file for this purpose.

There is no VT config file that needs to be created in this case.

The installation of TCP/IP requires the definition of parameters (network addresses) which vary from location to location.

For more information about installing TCP/IP, see the *CTOS TCP/IP Administration Guide*.

Section 5
Running the Emulator

This section describes how to run the VT220 Emulator using a direct or modem line, TCP/IP, or X.25 connection. This section also provides information on specifying ports for a modem, dialing a modem, and provides configuration screens and parameter descriptions for RS–232, TCP/IP, and X.25 connections.

Now you are ready to use the CTOS VT220 Emulator. The command you may use varies, depending on the type of connection you want to use.

Connection Type	**Command**
Direct or Modem line	VT Emulator
X.25 Gateway	X25 VT Emulator
TCP/IP	TCP/IP VT Emulator

Initially one of three VT configuration screens is displayed, depending on the VT Emulator command name you used to call the program.

Each configuration screen is similar. The major difference is that:

- On the Direct/Modem configuration screen, you must specify which CTOS workstation communication port you want to use.
- On the X.25 configuration screen, you must specify which configuration file (the *xxxx* suffix only) you want to use.
- On the TCP/IP configuration screen, you must specify the host name you want to use.

Using the VT Emulator Command

When you type *VT Emulator* and press the RETURN key, the following prompt screen appears:

```
VT Emulator
  [User Name]
  [Load Device]
  [Load VTE Palette? (def=Y)]
```

Parameter	Description
User Name	Optional. If the user logs on, the configuration file for that user will be displayed (if one exists), unless an alternate name is typed in this field. If VTConfig.*user* does not exist, a configuration file is created.
Load Device	Optional. If the emulator files are not on your current volume, type the volume name where the files are stored (such as [!Sys]).
Load VTE Palette	Optional. If you enter the default *Y*, the "Vt.Colour" palette file will be loaded. Entering *N* will let you use the same colors as the Executive.

Press the GO key and the configuration screen for the connection you are using will be displayed.

Using the X25 VT Emulator Command

When you type *X25 VT Emulator* and press the RETURN key, the following prompt screen appears:

```
X25 VT Emulator
  [User Name]
  [Load Device]
  [Load VTE Palette? (def=Y)]
```

Parameter	Description
User Name	Optional. If the user logs on, the configuration file for that user will be displayed (if one exists), unless an alternate name is typed in this field. If VTConfig.*user* does not exist, a configuration file is created.

Parameter	Description
Load Device	Optional. If the emulator files are not on your current volume, type the volume name where the files are stored (such as [!Sys]).
Load VTE Palette	Optional. If you enter the default *Y*, the "Vt.Colour" palette file will be loaded. Entering *N* will let you use the same colors as the Executive.

Press the GO key and the configuration screen for the connection you are using will be displayed.

Using the TCP/IP VT Emulator Command

When you type *TCP/IP VT Emulator* and press the RETURN key, the following prompt screen appears:

```
TCP/IP VT Emulator
  [User Name]
  [Load Device]
  [Load VTE Palette? (def=Y)]
```

Parameter	Description
User Name	Optional. If the user logs on, the configuration file for that user will be displayed (if one exists), unless an alternate name is typed in this field. If VTConfig.*user* does not exist, a configuration file is created.
Load Device	Optional. If the emulator files are not on your current volume, type the volume name where the files are stored (such as [!Sys]).
Load VTE Palette	Optional. If you enter the default *Y*, the "Vt.Colour" palette file will be loaded. Entering *N* will let you use the same colors as the Executive.

Press the GO key and the configuration screen for the connection you are using will be displayed.

Specifying a Port for a Modem

In using a modem line, you must specify which CTOS communication port the modem cable is plugged into. There are the following choices:

Entry	Definition
A–H	Port A–H
0A–0H	Port A–H
1A	Port A on the first Communication port expansion module
1B	Port B on the first Communication port expansion module
1C	Port C on the first Communication port expansion module
1D	Port D on the first Communication port expansion module
2A	Port A on the second Communication port expansion module
2B	Port B on the second Communication port expansion module
2C	Port C on the second Communication port expansion module
2D	Port D on the second Communication port expansion module

When you press the GO key to exit from the configuration screen, the VT220 Emulator will attempt to open the channel or the X.25 circuit, regardless of the port used.

If an error occurs, a 4 digit Error Code, followed by the appropriate error message, will be displayed. Please see the *CTOS Status Codes Reference Manual* for a detailed description of the error code.

Dialing with a Modem

This subsection describes how the VT220 Emulator can be used to dial a number on an AT command set compatible modem. Please note that the following instructions can vary depending on the modem you use.

You must ensure that the communication configuration file is set to the baud rate of the modem, normally 1200 or 2400 Baud.

Also ensure that the VTE Local Echo parameter is set to NO. The modem will echo all characters entered during the dial up sequence.

Normally, the following steps are taken:

1. Power on the modem.
2. Enter ATZ and Press RETURN.
3. Wait for OK message.
4. Enter ATD2365055.

In the example above, ATD is the dial command for the modem and 236–5055 is the phone number. If your telephone system supports Tone Dialing, then enter ATDT2365055.

The modem will respond with the message CONNECT if the connection has been successfully established or with NO CARRIER if the connection could not be established.

Study your modem user's manual before following the previous instructions to ensure that your modem accepts the standard command set.

You can use the CTOS VT220 Emulator's programmable keys to store dialing sequences (telephone numbers). For more information, see Section 7, "Programming Function and Keypad Keys."

RS–232 Configuration Screen

The RS–232 configuration screen, shown in Figure 5–1, is displayed when you initially run the VT Emulator command. This configuration screen also may be displayed at any time by pressing CODE–HELP.

Before you change the parameters in the configuration screen, you should make sure that overtype mode is on, that is, that the light in the overtype key is on. If the light is off, press the overtype key once to turn the light on.

```
CTOS VT220 Emulator R2.0 (RS 232) - Config for: Default

Terminal Type: 227 (052=VT52, 100=VT100, 227 or 228=VT220,
                    ANS=ANSI)
Character Set: N   (N=Normal, D=Dec International)
Local Echo:    N   (Y=Yes, N=No)
Attributes:    I   (I=Inverse, U=Underline, D=Dim)
Wrap Mode:     Y   (Y=Yes, N=No)
New Line:      1   (1=CR, 2=LF, 3=CRLF)
Status Line:   D   (Y=Yes, N=No, D=Date)
Keypad:        A   (N=Numeric Mode, A=Application Mode)
Cursor:        B   (U=Underline, B=Block, N=None)
Cr to CrLf:    N   (Y=Yes,N=No-Applys to incoming CR only)
VT220 Fks:     Y   (Y=Yes, N=No -VT220 Mode only)
Show Config:   Y   (Y=Shows at Startup Time, N=No)
Enable GO Key: N   (Y=GO key is stand-alone ESCAPE key)

Comms Channel: 0A  (A,B,C,D,E,F,G,H,0A,0B,0C,0D,0E,0F,0G,
                    0H,1A,1B,1C,1D,2A,2B,2C,2D)
Capture File:  [Spl]              ([Spl] default if blank)
Print Header:                     (None if blank)
```

Figure 5–1. RS–232 Configuration Screen

The following list describes the RS–232 configuration screen parameters:

Parameter	Description
Terminal Type (Default = 227)	Determines the type of terminal that the VT220 Emulator will emulate.

Parameter	Description
Character Set (Default = N)	227 or 228 defines whether an 8–Bit or 7–Bit character set will be used. The 7–Bit character set consists of 128 characters (N = Normal), while the 8–Bit character set consists of 256 characters (D = Dec International). Typically, VT terminals are run with the 7–Bit character set. However, to enable the multilingual features, you must use the 8–Bit character set. An 8–Bit character setting on the CTOS workstation will only be meaningful if the host computer sends and receives 8–Bit characters and the line is configured (with the configuration file–VtComms.Default or user–specific) as an 8–Bit line.
Local Echo (Default = N)	Determines whether the VT220 Emulator should display characters as they are entered from the keyboard (X = Terminal Echo Characters and N = Host Echo Characters). Normally, the host will echo each character to indicate that it was received properly. If every character typed is duplicated on the screen, the Local Echo should be turned off. If no characters appear on the screen, it should be turned on.
Attributes (Default = I)	Determines the default alternate display attribute you wish to use.
Wrap Mode (Default = Y)	Determines whether the emulator should move the cursor to the next line when the end of the line is reached.

Parameter	Description
New Line (Default = 1)	Determines whether the emulator should send (outgoing) a carriage return (1), a line feed (2), or a carriage return and a line feed (3) when the RETURN key is pressed.
Status Line (Default = D)	Contains one of the following values: Y Enables the complete status line display. D Enables the separator line and the date/time display only. N Disables the status line and the separator line.
Keypad (Default = N)	Determines the keypad mode. Numeric mode (N) is the default which sends the ASCII code for the number pressed. Host systems can override this parameter and turn the keypad mode on and off with special escape sequences. Application mode (A) sends unique escape sequences.
Cursor (Default = B)	Determines whether the cursor should be displayed. The cursor can be displayed as a block (B = Block), a line (U = Underline) or not displayed (N = None). Care should be taken with this parameter. If you set this parameter to "N", you will not be able to "see" where you are positioned within the screen.

Parameter	Description
Cr to CrLf (Default = N)	Determines whether an incoming Carriage Return will be mapped to a Carriage Return and Line Feed character. This option should be turned on if all the data from the host is written on the same line. It should be turned off if double line spacing is experienced.
VT220 Fks (Default = Y)	Determines how the function keys will perform. If this parameter is set to "Y", the following function keys perform the functions listed:

Keys	Functions
F1	Hold Screen
F2	Print Screen
F3	Enter Configuration Screen
F4	Switch to Local Mode
F5	Send Break Signal (RS–232 and TCP/IP only)
F11	Send ESCAPE character (ESC)
F12	Send BACKSPACE character (BS)
F13	Send LINEFEED character (LF)

Setting this parameter value to "Y" will also disable the use of user programmed values for the first five function keys (F1 through F5).

Show Config (Default = Y)	Determines whether the emulator displays the configuration screen each time you start the emulator.

Parameter	Description
Enable GO key (Default = N)	Determines whether the GO key acts as a freestanding ESC key. Such a keyboard arrangement is required for some applications. In VT220 mode, this configuration parameter has no effect because the GO key is mapped automatically to the DO key (F16).
Comms Channel (Default = 0A)	Determines which of the communication channels you wish to use for the Emulator. The channel names, "A" or "0A", "B" or "0B", refer to the communication channels on your CPU, while the channel names "1A" through "2D" refer to channels on the Communication Port Expansion Modules. For possible values see the subsection "Specifying a Port for a Modem." Check where the cable is plugged in and enter the appropriate channel ID. The channel cannot be changed once an emulation begins. To change the channel, press CODE–SHIFT–FINISH from the emulator to disconnect the line. Press the GO key to confirm the disconnected call and return you to the configuration screen where you may change the channel.
Capture File (Default=[Spl])	Determines the direction of printer output from the emulator. Normally, this will be a print queue, such as [Spl], but a filename may also be specified to enable the printing to be directed to a CTOS disk file.

X.25 Configuration Screen

The X.25 configuration screen, shown in Figure 5–2, is displayed when you initially run the X25 VT Emulator command. This configuration screen may be displayed at any time by pressing CODE–HELP.

Before you change the parameters in the configuration screen, you should make sure that overtype mode is on, that is, that the light in the overtype key is on. If the light is off, press the overtype key once to turn the light on.

```
  CTOS VT220 Emulator R2.0 (X.25) - Config for: Default

Terminal Type: 227 (052=VT52, 100=VT100, 227 or 228=VT220,
ANS=ANSI)
Character Set: N   (N=Normal, D=Dec International)
Local Echo:    N   (Y=Yes, N=No)
Attributes:    I   (I=Inverse, U=Underline, D=Dim)
Wrap Mode:     Y   (Y=Yes, N=No)
New Line:      1   (1=CR, 2=LF, 3=CRLF)
Status Line:   D   (Y=Yes, N=No, D=Date)
Keypad:        A   (N=Numeric Mode, A=Application Mode)
Cursor:        B   (U=Underline, B=Block, N=None)
Cr to CrLf:    N   (Y=Yes,N=No-Applys to incoming CR only)
VT220 Fks:     Y   (Y=Yes, N=No -VT220 Mode only)
Show Config:   Y   (Y=Shows at Startup Time, N=No)
Enable GO Key: N   (Y=GO key is stand-alone ESCAPE key)
Capture File:  [Spl]              ([Spl] default if blank)
Print Header:                     (None if blank)
X25 Config:    Default            ('Default' is blank)
X25 Parity:    N                  (Y = Yes, N = No)
```

Figure 5–2. X.25 Configuration Screen

The following list describes the X.25 configuration screen parameters:

Parameter	Description
Terminal Type (Default = 227)	Determines the type of terminal that the VT220 Emulator will emulate.

Parameter	Description
Character Set (Default = N)	227 or 228 defines whether an 8–Bit or 7–Bit character set will be used. The 7–Bit character set consists of 128 characters (N = Normal), while the 8–Bit character set consists of 256 characters (D = Dec International). Typically, VT terminals are run with the 7–Bit character set. However, to enable the multilingual features, you must use the 8–Bit character set. An 8–Bit character setting on the CTOS workstation will only be meaningful if the host computer sends and receives 8–Bit characters and the line is configured as an 8–Bit line.
Local Echo (Default = N)	Determines whether the VT220 Emulator should display characters as they are entered from the keyboard (X = Terminal Echo Characters and N = Host Echo Characters). Normally, the host will echo each character to indicate that it was received properly. If every character typed is duplicated on the screen, the Local Echo should be turned off. If no characters appear on the screen, it should be turned on. In X.25 Mode, specifying "N" to the Local Echo parameter forces the VT220 Emulator to send each character as an X.25 packet. This is a requirement for all Unix/Xenix products which react to all characters, such as with the screen editor "vi".
Attributes (Default = I)	Determines the default alternate display attribute you wish to use.

Parameter	Description
Wrap Mode (Default = Y)	Determines whether the emulator should move the cursor to the next line when the end of the line is reached.
New Line (Default = 1)	Determines whether the emulator should send (outgoing) a carriage return (1), a line feed (2), or a carriage return and a line feed (3) when the RETURN key is pressed.
Status Line (Default = D)	Contains one of the following values: Y Enables the complete status line display. D Enables the separator line and the date/time display only. N Disables the status line and the separator line.
Keypad (Default = N)	Determines the keypad mode. Numeric mode (N) is the default which sends the ASCII code for the number pressed. Host systems can override this parameter and turn the keypad mode on and off with special escape sequences. Application mode (A) sends unique escape sequences.

Parameter	Description
Cursor (Default = B)	Determines whether the cursor should be displayed. The cursor can be displayed as a block (B = Block), a line (U = Underline) or not displayed (N = None). Care should be taken with this parameter. If you set this parameter to "N", you will not be able to "see" where you are positioned within the screen.
Cr to CrLf (Default = N)	Determines whether an incoming Carriage Return will be mapped to a Carriage Return and Line Feed character. This option should be turned on if all the data from the host is written on the same line. It should be turned off if double line spacing is experienced.

Parameter	Description
VT220 Fks (Default = Y)	Determines how the function keys will perform. If this parameter is set to "Y", the following function keys perform the functions listed:

Keys	Functions
F1	Hold Screen
F2	Print Screen
F3	Enter Configuration Screen
F4	Switch to Local Mode
F5	Send Break Signal (RS–232 and TCP/IP only)
F11	Send ESCAPE character (ESC)
F12	Send BACKSPACE character (BS)
F13	Send LINEFEED character (LF)

Setting this parameter value to "Y" will also disable the use of user programmed values for the first five function keys (F1 through F5).

Show Config (Default = Y)	Determines whether the emulator displays the configuration screen each time you start the emulator.
Enable GO key (Default = N)	Determines whether the GO key acts as a freestanding ESC key. Such a keyboard arrangement is required for some applications. In VT220 mode, this configuration parameter has no effect because the GO key is mapped automatically to the DO key (F16).

Parameter	Description
Capture File (Default=[Spl])	Determines the direction of printer output from the emulator. Normally, this will be a print queue, such as [Spl], but a filename may also be specified to enable the printing to be directed to a CTOS disk file.
X25 Config (Default blank)	Defines the suffix to the configuration name. The actual filename is generated as follows: [Sys]<CtVt>X25Config.xxxx where xxxx is the configuration name as entered in this field. The configuration file name cannot be changed once an emulation begins. To change the configuration file name, press CODE–SHIFT–FINISH from the emulator to disconnect the line. Press the GO key to confirm the disconnected call and return you to the configuration screen where you may change the configuration file name.
X25 Parity (Default = N)	Determines whether the emulator should strip the 8th bit of a character.

TCP/IP Configuration Screen

The TCP/IP configuration screen, shown in Figure 5–3, is displayed when you initially run the TCP/IP VT Emulator command. This configuration screen may be displayed at any time by pressing CODE–HELP.

Before you change the parameters in the configuration screen, you should make sure that overtype mode is on, that is, that the light in the overtype key is on. If the light is off, press the overtype key once to turn the light on.

```
 CTOS VT220 Emulator R2.0 (TCP/IP) - Config for: Default

Terminal Type: 227 (052=VT52, 100=VT100, 227 or 228=VT220,
ANS=ANSI)
Character Set: N   (N=Normal, D=Dec International)
Local Echo:    N   (Y=Yes, N=No)
Attributes:    I   (I=Inverse, U=Underline, D=Dim)
Wrap Mode:     Y   (Y=Yes, N=No)
New Line:      1   (1=CR, 2=LF, 3=CRLF)
Status Line:   Y   (Y=Yes, N=No, D=Date)
Keypad:        N   (N=Numeric Mode, A=Application Mode)
Cursor:        B   (U=Underline, B=Block, N=None)
Map Cr to CrLf N   (Y=Yes,N=No-Applys to incoming CR only)
VT220 Fks:     Y   (Y=Yes, N=No -VT220 Mode only)

Show Config at StartUp time:  Y   (Y=Yes, N=No)

Enable GO Key: N   (Y=GO key is stand-alone ESCAPE key)

Capture File:  [Spl]   ([Spl] default if blank)
Print Header:          (None if blank)

          (Press HELP to get a list of configured hosts)
TCP/IP Host Name:            (Enter either host name or
(or) Internet Adr:                    Internet address)
TCP/IP Node Name:            (Node name with {} )
TCP/IP Parity: N             (Y = Strip, N = Do not Strip)
TCP/IP Binary: N             (Y = 8-Bit, N = 7-Bit)
```

Figure 5–3. TCP/IP Configuration Screen

The following list describes the TCP/IP configuration screen parameters:

Parameter	Description
Terminal Type (Default = 227)	Determines the type of terminal that the VT220 Emulator will emulate. The default value is "227".

Parameter	Description
Character Set (Default = N)	227 or 228 defines whether an 8–Bit or 7–Bit character set will be used. The 7–Bit character set consists of 128 characters (N = Normal), while the 8–Bit character set consists of 256 characters (D = Dec International). Typically, VT terminals are run with the 7–Bit character set. However, to enable the multilingual features, you must use the 8–Bit character set. An 8–Bit character setting on the CTOS workstation will only be meaningful if the host computer sends and receives 8–Bit characters and the line is configured (with the configuration file–VtComms.Default or user–specific) as an 8–Bit line.
Local Echo (Default = N)	Determines whether the VT220 Emulator should display characters as they are entered from the keyboard (X = Terminal Echo Characters and N = Host Echo Characters). Normally, the host will echo each character to indicate that it was received properly. If every character typed is duplicated on the screen, the Local Echo should be turned off. If no characters appear on the screen, it should be turned on.
Attributes (Default = I)	Determines the default alternate display attribute you wish to use.
Wrap Mode (Default = Y)	Determines whether the emulator should move the cursor to the next line when the end of the line is reached.

Parameter	Description
New Line (Default = 1)	Determines whether the emulator should send (outgoing) a carriage return (1), a line feed (2), or a carriage return and a line feed (3) when the RETURN key is pressed.
Status Line (Default = D)	Contains one of the following values: Y Enables the complete status line display. D Enables the separator line and the date/time display only. N Disables the status line and the separator line.
Keypad (Default = N)	Determines the keypad mode. Numeric mode (N) is the default which sends the ASCII code for the number pressed. Host systems can override this parameter and turn the keypad mode on and off with special escape sequences. Application mode (A) sends unique escape sequences.
Cursor (Default = B)	Determines whether the cursor should be displayed. The cursor can be displayed as a block (B = Block), a line (U = Underline) or not displayed (N = None). Care should be taken with this parameter. If you set this parameter to "N", you will not be able to "see" where you are positioned within the screen.

Parameter	Description
Map Cr to CrLf (Default = N)	Determines whether an incoming Carriage Return will be mapped to a Carriage Return and Line Feed character. This option should be turned on if all the output from the host is written on the same line. It should be turned off if double line spacing is experienced.
VT220 Fks (Default = Y)	Determines how the function keys will perform. If this parameter is set to "Y", the following function keys perform the functions listed: **Keys** **Functions** F1 Hold Screen F2 Print Screen F3 Enter Configuration Screen F4 Switch to Local Mode F5 Send Break Signal (RS–232 and TCP/IP only) F11 Send ESCAPE character (ESC) F12 Send BACKSPACE character (BS) F13 Send LINEFEED character (LF) Setting this parameter value to "Y" will also disable the use of user programmed values for the first five function keys (F1 through F5).
Show Config at Startup time (Default = Y)	Determines whether the emulator displays the configuration screen each time you start the emulator.

Parameter	Description
Enable GO key (Default = N)	Determines whether the GO key acts as a freestanding ESC key. Such a keyboard arrangement is required for some applications. In VT220 mode this configuration parameter has no effect because the GO key is mapped automatically to the DO key (F16).
Capture File (Default=[Spl])	Determines the direction of printer output from the emulator. Normally, this will be a print queue, such as [Spl], but a filename may also be specified to enable the printing to be directed to a CTOS disk file.
TCP/IP Host Name (or) InterNet Adr	Enter the TCP/IP host name or the InterNet address. If both are specified, the TCP/IP host name will be used. The host name, InterNet address, or node name cannot be changed once an emulation begins. To change the host name, InterNet address, or node name, press CODE–SHIFT–FINISH from the emulator to disconnect the line. Press the GO key to confirm the disconnected call and return you to the configuration screen where you may change the host name, InterNet address, or node name.
TCP/IP Node Name	Node (in braces) where the TCP/IP Gateway is installed. For example, {remote host}
TCP/IP Parity (Default = N)	Determines whether the emulator should strip the 8th bit of a character.
TCP/IP Binary (Default = N)	Determines whether 7 or 8 bit characters are used.

List of Hosts

While inside the emulator configuration screen, you may press the HELP key to obtain a list of hosts.

When you press the HELP key, you obtain a list from the node, if a node name is present on the TCP/IP configuration screen. If a node name is not specified, it gets information from the server or local gateway.

Press any key to go back to the configuration screen. In the configuration screen, enter the desired host name.

Section 6
Keyboard Configurations

This section describes the functions of CTOS keys during VT220, VT100, and ANSI emulation.

For each mode, the following lists are provided:

- Special Keys
- Function Keys
- Control Keys
- Keypad Keys
- Erase/Delete/Insert Keys
- Print Keys

Since the CTOS keyboard is different from typical VT100/220 keyboards, it has been necessary to reassign some keys.

In addition, there are utility keys available for all three types of emulation. See "Utility Keys" at the end of this section.

Note: *In this section, there are three different uses for the word* ***mode****. There are terminal type modes such as VT220 and VT100. In regard to the keys, there is application mode and numeric mode. In regard to escape sequences, there is 7–bit control mode and 8–bit control mode.*

VT220 Mode Keyboard

The following subsections describe the functions of certain CTOS keys and key sequences during VT220 terminal type emulation.

VT220 Mode Special Keys

The following list defines CTOS keys which are not on a DEC VT220 North American keyboard.

CTOS Keys	Description
FINISH	Terminates the emulator
CODE–SHIFT–FINISH	Clear the call (X.25), drops the line (RS232C), or closes the connection (TCP/IP)
CODE–MARK	Sends BREAK signal (RS–232 and TCP/IP only)
CANCEL	Sends ESCAPE character
SHIFT–CANCEL	Clears screen and moves cursor to home
CODE–SHIFT–CANCEL	Resets the terminal, clears acreens, resets function keys and moves the cursor to home
SHIFT–HELP	Displays on–line HELP
CODE–HELP	Displays the Configuration screen
CODE–SHIFT–Q	Load an external Function Key Definition file
CODE–SHIFT–T	Displays the File Transfer screen
CODE–SHIFT–F	Displays Function Key Definition screen
CODE–SHIFT–B	Clears the contents of all user–defined function keys
CODE–SHIFT–S	Saves user defined function keys
CODE–SHIFT–R	Restores previously saved function keys (saved by CODE–SHIFT–S)
CODE–SHIFT–6	Turns on Keyboard Repeat
CODE–SHIFT–7	Turns off Keyboard Repeat
CODE–SHIFT–9	Shows current TAB settings
CODE–SHIFT–C	Enters a control character
CODE–SHIFT–COPY	Initiates the File Receive Facility

VT220 Mode Function Keys

The following list defines the function keys used in VT220 terminal type emulation. Function keys F11 through F20 are initiated by pressing the CODE key and F1, or F2, or F3, and so on.

The codes generated by keys F1 through F5 and F11 through F13 will depend on the setting of the "Std VT220 Fks" parameter on the configuration screen. If this parameter is set to "Y", then the keys will perform the following functions:

CTOS Keys	Function
F1	Hold screen (Pause)
F2	Print screen
F3	Enter Configuration screen
F4	Switch to Local Mode
F5	Sends Break Signal (RS–232 and TCP/IP only)
F11 [Code F1]	Sends ESCAPE character (ESC)
F12 [Code F2]	Sends BACKSPACE character (BS)
F13 [Code F3]	Sends LINEFEED character (LF)

If this parameter is set to "N", then these function keys will send the escape sequences as outlined in the following list.

Note: *All escape sequences described in this section are generated in 7–bit control mode. In 8–bit control mode, ESC [is replaced by the CSI character and ESC O is replaced by the SS3 character.*

CTOS Keys	Description
F1	Sends an ESCAPE sequence to the host. Denotes that the F1 function key was pressed: ESC [12 ~
F2	Sends an ESCAPE sequence to the host: ESC [13 ~
F3	Sends an ESCAPE sequence to the host: ESC [14 ~

CTOS Keys	Description
F4	Sends an ESCAPE sequence to the host: ESC [15 ~
F5	Sends an ESCAPE sequence to the host: ESC [16 ~
F6 to F10	Sends function key sequence for these function keys to the host: ESC [nn ~ where nn is 17 through 21
F11 to F20 [CODE–F1 to CODE–F10]	Sends function key sequence for VT220 function keys **F11** to **F20** to the host: ESC [nn ~ where nn is 23, 24, 25, 26, 28, 29, 31, 32, 33, and 34
SHIFT–F1 to SHIFT–F10	Sends the **user–defined** value for VT220 function keys **F1** to **F10** to the host (beeps if no user defined values)
SHIFT–CODE–F1 to SHIFT–CODE–F10	Sends the **user–defined** value for VT220 function keys **F11** to **F20** to the host (beeps if no user defined values)
GO	Sends the function key string for VT220 key **F16** (DO) to the host: ESC [29 ~
HELP	Sends the function key string for VT220 key **F15** (HELP) to the host: ESC [28 ~
PAGE	Sends the sequence for the VT220 key FIND to the host: ESC [1 ~
SENT	Sends the sequence for the VT220 key INSERT HERE to the host: ESC [2 ~
LINE	Sends the sequence for the VT220 key REMOVE to the host: ESC [3 ~
COL	Sends the sequence for the VT220 key SELECT to the host: ESC [4 ~
PARA and PREV PAGE	Sends the sequence for the VT220 key PREV SCREEN to the host: ESC [5 ~

CTOS Keys	Description
WORD and NEXT PAGE	Sends the sequence for the VT220 key NEXT SCREEN to the host: ESC [6 ~

On the CTOS K1 keyboard, the PAGE, SENT, LINE, COL, PARA, and WORD keys are not available.

VT220 Mode Control Keys

The following list defines the Control Keys used in VT220 terminal type emulation.

CTOS Keys	Description
CODE– A to CODE– Z or CODE– a to CODE– z	Sends the appropriate Control Code to the host (CODE–A is hex 01, which is Control–A, CODE–B is hex 02, etc.)
CODE– 2	Sends hex 00 (NULL) to the host
CODE– 3 or CODE– [	Sends the ESCAPE character (hex 1B) to the host
CODE– 4	Sends the FS character (hex 1C) to the host
CODE– 5 or CODE–]	Sends the GS character (hex 1D) to the host
CODE– 6	Sends the RS character (hex 1E) to the host
CODE– 7	Sends the US character (hex 1F) to the host

VT220 Mode Keypad Keys

The KEYPAD can be turned on or off by the configuration screen or by the host. The current status of the Keypad can be found in the status line display.

The following list defines the KEYPAD keys used in VT220 terminal type emulation. All keys shown in the following list are located on the keypad portion of the keyboard.

CTOS Keys	VT Usage	(Sequence sent to the host) Application Mode	Numeric Mode
% (Percentage)	PF1	ESC O P	ESC O P
x (Multiply)	PF2	ESC O Q	ESC O Q
/ (Divide)	PF3	ESC O R	ESC O R
– (Minus)	PF4	ESC O S	ESC O S
0	0	ESC O p	ESC O 0
1	1	ESC O q	ESC O 1
2	2	ESC O r	ESC O 2
3	3	ESC O s	ESC O 3
4	4	ESC O t	ESC O 4
5	5	ESC O u	ESC O 5
6	6	ESC O v	ESC O 6
7	7	ESC O w	ESC O 7
8	8	ESC O x	ESC O 8
9	9	ESC O y	ESC O 9
+	+	ESC O m	ESC O +
=	=	ESC O l	ESC O =
.	.	ESC O n	ESC O .
ENTER	ENTER	ESC O M	ESC O (CR)

These keyboard assignments were chosen to ensure that the VT220 keys are physically located in the same place as the keys on a real VT220 keyboard, for the benefit of the touch typists.

If you have a K1 keyboard, the numeric keypad keys follow the previous chart. The special keys have been implemented differently because the K1 keyboard has fewer keypad keys than the K2 keyboard. The K1 keyboard contains no word processing keys such as FIND, INSERT, and SELECT. The special keys are implemented as follows on a K–1 keyboard:

1. Press CODE–SHIFT–K
2. Enter the Keypad Character on the bottom line of the display, according to the following chart:

Character	Function
1	PF1
2	PF2
3	PF3
4	PF4
–	Keypad Minus
.	Keypad Period
,	Keypad Comma

The KEYPAD can be turned on or off by the configuration screen or by the host. The current status of the Keypad can be found in the status line display.

If the Keypad is in numeric mode, the keys shown above will send their normal ASCII representation to the host. However, even when the Keypad is in numeric mode, the Keypad–key code sequences may still be generated by pressing the CODE key and the appropriate Keypad key. Standard VT220 terminals do not provide this facility.

VT220 Mode Erase/Delete/Insert Keys

The following list describes the Erase/Delete/Insert Keys used in VT220 terminal type emulation.

CTOS Keys	Data Sent to Host
DELETE or DELETE CHAR	DELETES character sequence
SHIFT–DELETE	Erases to the end of the current line sequence
CODE–DELETE	Erases the entire current line sequence
CODE–SHIFT–DELETE	Erases the entire screen sequence
CODE–UP ARROW	Inserts a character sequence
CODE–SHIFT–UP ARROW	Inserts a line at the current line sequence
CODE–SHIFT–DN ARROW	Deletes the current line sequence

VT220 Mode Print Keys

The following list defines the Print Keys used in VT220 emulation mode.

CTOS Keys	Description
SHIFT–COPY	Prints keyboard and host input to Printer or File until the COPY key is pressed
CODE–COPY	Prints entire currently displayed screen to Printer or File
COPY	Ends printing for either of the copy functions

The printout is directed to the file specification entered in the configuration screen. The destination may be a printer, a spooled queue, or a disk file.

VT100 Mode Keyboard

The following subsections describe the functions of certain CTOS keys and key sequences during VT100 terminal type emulation.

VT100 Mode Special Keys

The following list defines CTOS keys which are not on a DEC VT100 North American keyboard.

CTOS Keys	Description
FINISH	Terminates the emulator
CODE–SHIFT–FINISH	Clears the call (X.25), drops the line (RS232C), or closes the connection (TCP/IP)
CODE–MARK	Sends BREAK signal (RS–232 and TCP/IP only)
CANCEL	Sends ESCAPE character
SHIFT–CANCEL	Clears screen and moves cursor to home
CODE–SHIFT–CANCEL	Resets the terminal, clears screens, resets function keys, and moves the cursor to home
HELP or SHIFT–HELP	Displays on–line HELP
CODE–HELP	Displays the Configuration screen
CODE–SHIFT–Q	Load an external Function Key Definition file
CODE–SHIFT–T	Displays the File Transfer screen
CODE–SHIFT–F	Displays Function Key Definition screen
CODE–SHIFT–B	Clears the contents of all user–defined function keys
CODE–SHIFT–S	Saves user defined function keys
CODE–SHIFT–R	Restores previously saved function keys (saved by CODE–SHIFT–S)

CTOS Keys	Description
CODE–SHIFT–6	Turns on Keyboard Repeat
CODE–SHIFT–7	Turns off Keyboard Repeat
CODE–SHIFT–9	Shows current TAB settings
CODE–SHIFT–C	Enters a control character
CODE–SHIFT–COPY	Initiates the File Receive Facility

VT100 Mode Function Keys

The following list defines the function keys used in VT100 terminal type emulation.

CTOS Keys	Description
F1 to F10	Sends the **user–defined** value for a function key 1 through 10 to the host or a predefined ESCAPE sequence: ESC [nn ~ where nn is 17 through 21
F11 to F20 [CODE–F1 to CODE–F10]	Sends the **user–defined** value for a function key 11 through 20 to the host or a predefined ESCAPE sequence: ESC [nn ~ where nn is 23, 24, 25, 26, 28, 29, 31, 32, 33, or 34
SHIFT–F1 to SHIFT–F10	Sends the **user–defined** value for a function key 21 through 30 to the host or a predefined ESCAPE sequence: ESC [nn ~
PAGE	Sends ESC [81 ~ to host
SENT	Sends ESC [82 ~ to host
LINE	Sends ESC [83 ~ to host
COL	Sends ESC [84 ~ to host
PARA	Sends ESC [85 ~ to host
WORD	Sends ESC [86 ~ to host
PREV PAGE	Sends ESC [91 ~ to host
NEXT PAGE	Sends ESC [92 ~ to host

CTOS Keys	Description
SCROLL UP	Sends ESC [93 ~ to host
SCROLL DOWN	Sends ESC [94 ~ to host

On the CTOS K1 keyboard, the PAGE, SENT, LINE, COL, PARA, and WORD keys are not available.

VT100 Mode Control Keys

The following list defines the Control Keys used in VT100 terminal type emulation.

CTOS Keys	Description
CODE– A to CODE– Z or CODE– a to CODE– z	Sends the appropriate Control Code to the host (CODE–A is hex 01, which is Control–A, CODE–B is hex 02, etc.)
CODE– 2	Sends hex 00 (NULL) to the host
CODE– 3 or CODE– [	Sends the ESCAPE character (hex 1B) to the host
CODE– 4	Sends the FS character (hex 1C) to the host
CODE– 5 or CODE–]	Sends the GS character (hex 1D) to the host
CODE– 6	Sends the RS character (hex 1E) to the host
CODE– 7	Sends the US character (hex 1F) to the host

VT100 Mode Keypad Keys

The KEYPAD can be turned on or off by the configuration screen or by the host. The current status of the Keypad can be found in the status line display.

The following list defines the KEYPAD keys used in VT100 terminal type emulation. All keys shown in the following list are located on the keypad portion of the keyboard.

		(Sequence sent to the host)	
CTOS Keys	**VT Usage**	**Application Mode**	**Numeric Mode**
% (Percentage)	PF1	ESC O P	ESC O P
x (Multiply)	PF2	ESC O Q	ESC O Q
/ (Divide)	PF3	ESC O R	ESC O R
– (Minus)	PF4	ESC O S	ESC O S
0	0	ESC O p	ESC O 0
1	1	ESC O q	ESC O 1
2	2	ESC O r	ESC O 2
3	3	ESC O s	ESC O 3
4	4	ESC O t	ESC O 4
5	5	ESC O u	ESC O 5
6	6	ESC O v	ESC O 6
7	7	ESC O w	ESC O 7
8	8	ESC O x	ESC O 8
9	9	ESC O y	ESC O 9
+	+	ESC O m	ESC O +
=	=	ESC O l	ESC O =
.	.	ESC O n	ESC O .
ENTER	ENTER	ESC O M	ESC O (CR)

These keyboard assignments were chosen to ensure that the VT100 keys are physically located in the same place as the keys on a real VT100 keyboard, for the benefit of the touch typists.

If you have a K1 keyboard, the numeric keypad keys follow the previous chart. The special keys have been implemented differently because the K1 keyboard has fewer keypad keys than the K2 keyboard. The K1 keyboard contains no word processing keys such as FIND, INSERT, and SELECT. The special keys are implemented as follows on a K–1 keyboard:

1. Press CODE–SHIFT–K
2. Enter the Keypad Character on the bottom line of the display, according to the following chart:

Character	Function
1	PF1
2	PF2
3	PF3
4	PF4
–	Keypad Minus
.	Keypad Period
,	Keypad Comma

The KEYPAD can be turned on or off by the configuration screen or by the host. The current status of the Keypad can be found in the status line display.

If the Keypad is turned off, the keys shown above will send their normal ASCII representation to the host. However, even when the Keypad is turned off, the Keypad–key code sequences may still be generated by pressing the CODE key and the appropriate Keypad key.

VT100 Mode Erase/Delete/Insert Keys

The following list describes the Erase/Delete/Insert Keys used in VT100 terminal type emulation.

CTOS Keys	Data Sent to Host
DELETE or DELETE CHAR	DELETE Character sequence
SHIFT–DELETE	Erase to the end of the current line sequence
CODE–DELETE	Erase the entire current line sequence
CODE–SHIFT–DELETE	Erase the entire screen sequence
CODE–UP ARROW	Insert a character sequence
CODE–SHIFT–UP ARROW	Insert a line at the current line sequence
CODE–SHIFT–DN ARROW	Delete the current line sequence

VT100 Mode Print Keys

The following list defines the Print Keys used in VT100 emulation mode.

CTOS Keys	Description
SHIFT–COPY	Print keyboard and host input to Printer or File until the COPY key is pressed
CODE–COPY	Print entire currently displayed screen to Printer or File
COPY	End Printing for either of the copy functions

The printout is directed to the file specification entered in the configuration screen. The destination may be a printer, a spooled queue, or a disk file.

ANSI Mode Keyboard

The following subsections describe the keys which are different between the CTOS keyboard and the ANSI keyboard only.

The emulator provides some facilities not normally available on the ANSI keyboard.

ANSI Mode Special Keys

The following list defines keys which are normally not available on the ANSI keyboard.

CTOS Keys	Description
FINISH	Sends Control–D character
SHIFT–FINISH	Terminates the emulator
CODE–FINISH	Terminates the emulator
CODE–SHIFT–FINISH	Clears the call (X.25), drops the line (RS232C), or closes the connection (TCP/IP)
CANCEL	Sends ESC [H to host
MARK	Sends ESC [W to host
BOUND	Sends Control–B to host
MOVE	Sends ' to host
OVERTYPE	Sends ESC [L to host
PREV PAGE	Sends ESC [I to host
NEXT PAGE	Sends ESC [G to host
SCROLL UP	Sends ESC [A to host
SCROLL DOWN	Sends ESC [B to host
CODE–MARK	Sends BREAK signal (RS–232 and TCP/IP only)
SHIFT–CANCEL	Clears screen and moves cursor to home

CTOS Keys	Description
CODE–SHIFT–CANCEL	Resets the terminal, clears screens, resets function keys and moves the cursor to home
HELP or SHIFT–HELP	Displays on–line HELP
CODE–HELP	Displays the Configuration screen
CODE–SHIFT–Q	Load an external Function Key Definition file
CODE–SHIFT–T	Displays the File Transfer screen
CODE–SHIFT–F	Displays Function Key Definition screen
CODE–SHIFT–B	Clears the contents of all user–defined function keys
CODE–SHIFT–S	Saves user–defined function keys
CODE–SHIFT–R	Restores previously saved function keys (saved by CODE–SHIFT–S)
CODE–SHIFT–6	Turns on Keyboard Repeat
CODE–SHIFT–7	Turns off Keyboard Repeat
CODE–SHIFT–9	Shows current TAB settings
CODE–SHIFT–C	Enters a control character
CODE–SHIFT–COPY	Initiates the File Receive Facility

ANSI Mode Function Keys

The following list defines the Function Keys used in ANSI emulation mode.

CTOS Keys	Description
F1	Sends ESC [M to host
F2	Sends ESC [N to host
F3	Sends ESC [O to host
F4	Sends ESC [P to host

CTOS Keys	Description
F5	Sends ESC [Q to host
F6	Sends ESC [R to host
F7	Sends ESC [S to host
F8	Sends ESC [T to host
F9	Sends ESC [U to host
F10	Sends ESC [V to host

ANSI Mode Control Keys

The following list defines the Control Keys used in ANSI emulation mode.

CTOS Keys	Description
CODE– A to CODE– Z or CODE– a to CODE– z	Sends the appropriate Control Code to the host (CODE–A is hex 01, which is Control–A, CODE–B is hex 02, etc.)
CODE– 2	Sends hex 00 (NULL) to the host
CODE– 3 or CODE– [	Sends the ESCAPE character (hex 1B) to the host
CODE– 4	Sends the FS character (hex 1C) to the host
CODE– 5 or CODE–]	Sends the GS character (hex 1D) to the host
CODE– 6	Sends the RS character (hex 1E) to the host
CODE– 7	Sends the US character (hex 1F) to the host

ANSI Mode Keypad Keys

The keypad is not applicable in ANSI mode. However, if requested by turning on the keypad, the emulator will send the same escape sequences as in VT220 mode.

		(Sequence sent to the host)	
CTOS Keys	**VT Usage**	**Application Mode**	**Numeric Mode**
% (Percentage)	PF1	ESC O P	ESC O P
x (Multiply)	PF2	ESC O Q	ESC O Q
/ (Divide)	PF3	ESC O R	ESC O R
– (Minus)	PF4	ESC O S	ESC O S
0	0	ESC O p	ESC O 0
1	1	ESC O q	ESC O 1
2	2	ESC O r	ESC O 2
3	3	ESC O s	ESC O 3
4	4	ESC O t	ESC O 4
5	5	ESC O u	ESC O 5
6	6	ESC O v	ESC O 6
7	7	ESC O w	ESC O 7
8	8	ESC O x	ESC O 8
9	9	ESC O y	ESC O 9
+	+	ESC O m	ESC O +
=	=	ESC O l	ESC O =
.	.	ESC O n	ESC O .
ENTER	ENTER	ESC O M	ESC O (CR)

These keyboard assignments were chosen to ensure that the ANSI keys are physically located in the same place as the keys on a real ANSI keyboard, for the benefit of the touch typists.

If you have a K1 keyboard, the numeric keypad keys follow the previous chart. The special keys have been implemented differently because the K1 keyboard has fewer keypad keys than the K2 keyboard. The K1 keyboard contains no word processing keys such as FIND, INSERT, and SELECT. The special keys are implemented as follows on a K–1 keyboard:

1. Press CODE–SHIFT–K
2. Enter the Keypad Character on the bottom line of the display, according to the following chart:

Character	Function
1	PF1
2	PF2
3	PF3
4	PF4
–	Keypad Minus
.	Keypad Period
,	Keypad Comma

The KEYPAD can be turned on or off by the configuration screen or by the host. The current status of the Keypad can be found in the status line display.

If the Keypad is turned off, the keys shown above will send their normal ASCII representation to the host. However, even when the Keypad is turned off, the Keypad–key code sequences may still be generated by pressing the CODE key and the appropriate Keypad key. Standard ANSI terminals do not provide this facility.

ANSI Mode Erase/Delete/Insert Keys

The following list describes the Erase/Delete/Insert Keys used in ANSI terminal type emulation.

CTOS Keys	Data Sent to Host
DELETE or DELETE CHAR	DELETE Character sequence
SHIFT–DELETE	Erase to the end of the current line sequence
CODE–DELETE	Erase the entire current line sequence
CODE–SHIFT–DELETE	Erase the entire screen sequence
CODE–UP ARROW	Insert a character sequence
CODE–SHIFT–UP ARROW	Insert a line at the current line sequence
CODE–SHIFT–DN ARROW	Delete the current line sequence

ANSI Mode Print Keys

The following list defines the Print Keys used in ANSI emulation mode.

CTOS Keys	Description
SHIFT–COPY	Print keyboard and host input to Printer or File until the COPY key is pressed
CODE–COPY	Print entire currently displayed screen to Printer or File
COPY	End Printing for either of the copy functions

The printout is directed to the file specification entered in the configuration screen. The destination may be a printer, a spooled queue, or a disk file.

Utility Keys

The following section shows the utility keys provided by the emulator.

CTOS Keys	Description
CODE–SHIFT–I	Displays the last 2000 characters received from the host
CODE–SHIFT–O	Displays the last 2000 characters sent to the host
CODE–; or CODE–SHIFT–:	Clears the Input and Output Buffers
CODE–SHIFT–D	Displays last ESCAPE sequence and the last Function Key string sent to the host
CODE–BACKSPACE	Displays the values received from the keyboard handler
CODE–SHIFT–2	Turns on X.25 or TCP/IP debugging feature
CODE–SHIFT–3	Turns on RS–232 debugging feature
CODE–SHIFT–4	Displays last Function Key definition string received from the host
CODE–SHIFT–6	Turns on Keyboard Repeat (default)
CODE–SHIFT–7	Turns off Keyboard Repeat
CODE–SHIFT–9	Displays the current TAB settings
CODE–SHIFT–C	Enter control character
CODE–SHIFT–Y	Toggles between 24 and 33 lines of text on high resolution monitors
CODE–SHIFT–V	Invokes the Change Current Path menu
CODE–SHIFT–X	Invokes the File Transfer utility

For additional debugging information, see Appendix B, Debugging Features.

Keyboard Illustrations

The following five figures represent the CTOS K1, K2, K3, and K5 keyboards, and the DEC VT220 Terminal North American keyboard layout.

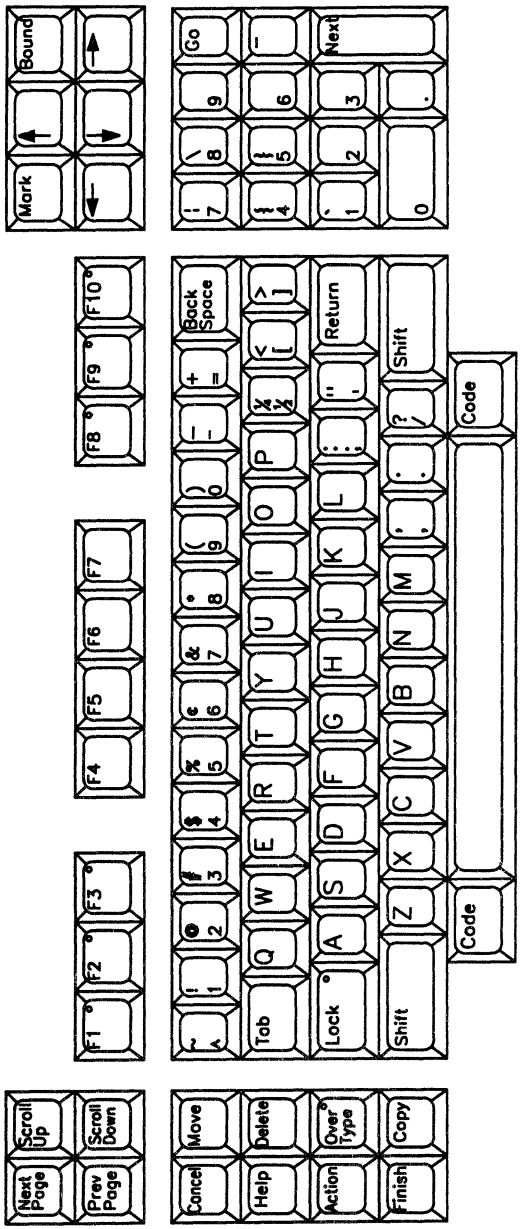

Figure 6–1. CTOS K1 Keyboard Layout

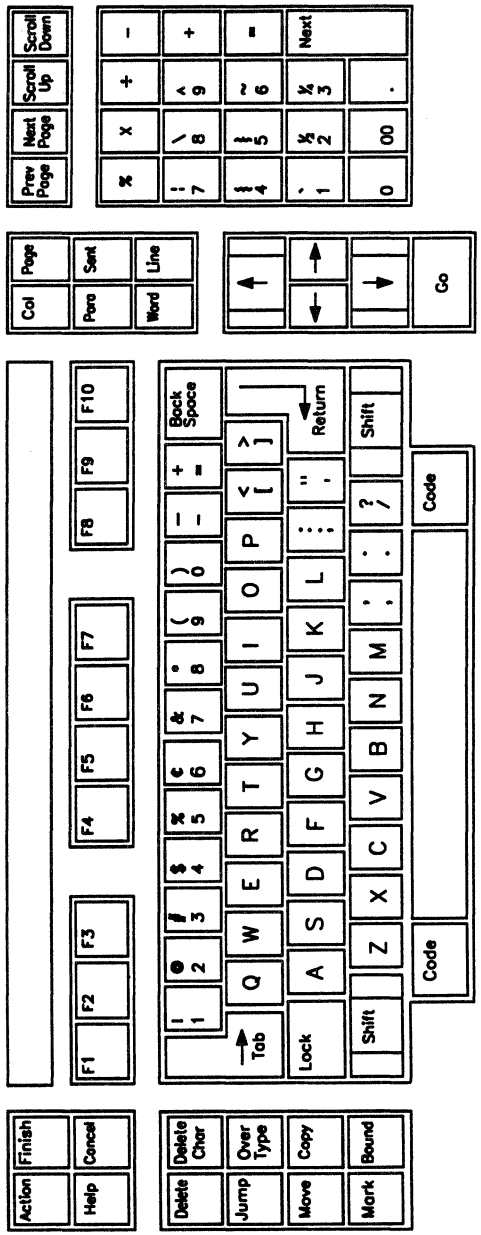

Figure 6–2. CTOS K2 Keyboard Layout

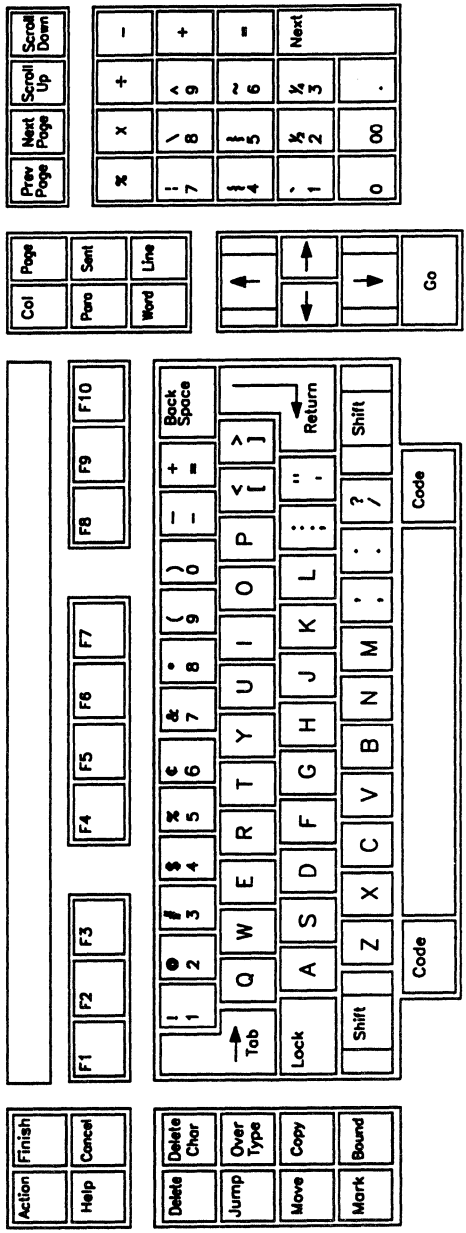

Figure 6–3. CTOS K3 Keyboard Layout

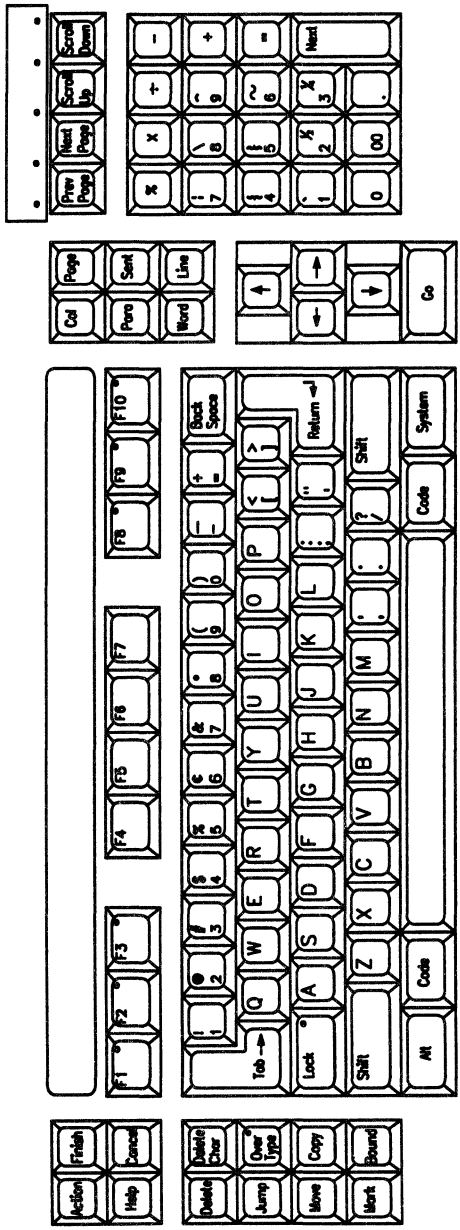

Figure 6–4. CTOS K5 Keyboard Layout

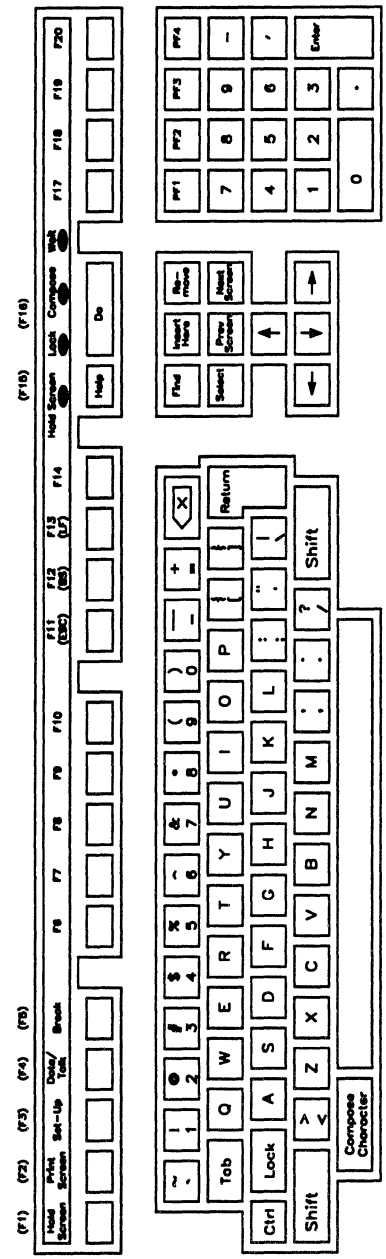

Figure 6–5. DEC VT220 Terminal North American Keyboard Layout

Section 7
Programming Function and Keypad Keys

This section describes how to define function keys and keypad keys.

Defining Function Keys

In VT100 and VT220 Mode, the VT220 Emulator allows you to define Function Keys in two different ways:

- Entering the definitions manually
- Loading the definitions from a file

Each user–defined function key can contain up to 30 characters.

In VT100 mode, you can define 30 function keys. These keys are F1 through F10, CODE–F1 through CODE–F10, and SHIFT–F1 through SHIFT–F10.

In VT220 mode, you may have 20 user–definable function keys. These keys are SHIFT–F1 through SHIFT–F10 and SHIFT–CODE–F1 through SHIFT–CODE–F10. However, when the value for **VT220 Fks** is set to YES on your configuration screen, you can only program keys F6 through F10.

Entering the Definitions Manually

The host can send an escape sequence to program your function keys. You may communicate with the host programmer to determine which escape sequence to send.

Anytime you configure your function keys, the emulator stores the function key values in the user's configuration file.

To manually create, display, or modify the text of any of the above function keys, press CODE–SHIFT–F.

The VT220 Emulator will display a screen form that allows you to enter up to 30 characters per function key.

Control characters may be entered by prefixing a ^ to an ASCII character. For example, a Control A may be entered as ^A or the escape character may be entered as ^ [. For details on control keys and their functions, see the Special Control Key Chart at the end of this section.

Loading the Definitions from a File

The VT220 Emulator allows you to define function keys in an external ASCII file that must be created in the editor, and then also load those definitions into the emulator.

The external function key definition files are called **<CtVt>LetterX.Fks** where X is any letter (A through Z) indicating the key you will need to press when you want to load that function key file.

The function keys defined are line relative; for example, the first line in the file describes Function Key 1, the second line describes Function Key 2, and so on. Lines are terminated with the RETURN key. Only the first 30 characters of a line are loaded.

Comments may be embedded in the function key definition file.

To embed a comment using the editor:

1. Press CODE–I. The system prompts you for a hexadecimal character.
2. Enter C6 (this is the hexadecimal character for | which is the separator character) and press the GO key.
3. Enter your comment. (Anything entered on the line after the separator character is considered a comment.)

To load function key files into the emulator:

1. Press CODE–SHIFT–Q. The emulator prompts you for the function–key–load–file letter.
2. Enter the letter that you used in the name of your Function Key Definition file. (For example, if you named your Function Key Definition file LetterA.Fks, you now enter an A. If you named your Function Key Definition file, LetterZ.Fks, you now enter a Z.)

Your function keys are now loaded. To display your current key definitions, press CODE–SHIFT–F.

The sample screen in Figure 7–1 shows the function key definitions of the 'O' file, which is specially designed for the OFIS Manager product.

```
CTOS VT220 Emulator R2.0 - Function Key Definitions

Fk  1: ^[OM  F1=Execute          Fk 10: ^W    F10=Start
Fk  2: ^[OQ  F2=Help             Fk 11: ^Z    F11=EXECUTE
Fk  3: ^C    F3=Center Tab       Fk 12: ^[Oy  F12=Move
Fk  4: ^D    F4=Decimal Tab      Fk 13: ^A    F13=Command
Fk  5: ^R    F5=Right Tab        Fk 14: ^[On  F14=Window
Fk  6: ^[OS  F6=Format           Fk 15: ^[OR  F15=Replace
Fk  7: ^F    F7=Extended Format  Fk 16: ^U    F16=Repeat
                                              Replace
Fk  8: ^[OP  F8=Mark             Fk 17: ^G    F17=Go To
Fk  9: ^[OP  F9=Search           Fk 18: ^V    F18=Column
                                              Mark
Fk 10: ^W    F10=Start Merge     Fk 19: ^[O1  F19=Search
                                             from Top
Fk 11: ^Z    F11=EXECUTE         Fk 20: ^E    F20=End
                                              Merge

Control characters may be entered by prefixing the
        character with the '^' character.
```

Figure 7–1. OFIS Manager Function Key Screen

Restoring the User–Defined Function Keys

If user–defined programming functions have been modified or redefined from a file, you can restore the user–defined function definitions from your configuration file by pressing CODE–SHIFT–R.

Defining Keypad Keys

The VT220 Emulator allows you to program the 0 through 9 keys on the main keyboard. Each of these keys may contain a string of up to 30 characters.

To create, display, or modify the key definitions press CODE–SHIFT–P.

You can edit these key definitions by moving the cursor to the desired definition and then adding or deleting information. Control keys may be entered by prefixing the appropriate alpha character with a ^. For example, if you want to include a carriage return (Control M) in the key definition, you enter ^M for the carriage return. For details on control keys and their functions, see the Special Control Key chart at the end of this section.

To send a programmed sequence to the host:

1. Press CODE–GO. You are prompted for the key number (0–9) which holds the desired sequence.
2. Enter the number from the main keyboard.

Special Control Key Chart

The following list describes the special keys which may be used during function key definitions (ASCII notation), their respective hexadecimal value and their ASCII abbreviated name.

Note: *The special control key combinations are not case sensitive.*

Special Control Key Combination	Hex Value	Function	ASCII Name
^ @	Hex 00	Control 0	NUL
^ A	Hex 01	Control A	SOH
^ B	Hex 02	Control B	STX
^ C	Hex 03	Control C	ETX
^ D	Hex 04	Control D	EOT
^ E	Hex 05	Control E	ENQ

Special Control Key Combination	Hex Value	Function	ASCII Name
^ F	Hex 06	Control F	ACK
^ G	Hex 07	Control G	BEL
^ H	Hex 08	Control H	BS
^ I	Hex 09	Control I	TAB
^ J	Hex 0A	Control J	LF
^ K	Hex 0B	Control K	VT
^ L	Hex 0C	Control L	FF
^ M	Hex 0D	Control M	CR
^ N	Hex 0E	Control N	SO
^ O	Hex 0F	Control O	SI
^ P	Hex 10	Control P	DLE
^ Q	Hex 11	Control Q	DC1
^ R	Hex 12	Control R	DC2
^ S	Hex 13	Control S	DC3
^ T	Hex 14	Control T	DC4
^ U	Hex 15	Control U	NAK
^ V	Hex 16	Control V	SYN
^ W	Hex 17	Control W	ETB
^ X	Hex 18	Control X	CAN
^ Y	Hex 19	Control Y	EM
^ Z	Hex 1A	Control Z	SUB
^ 3 or ^ [	Hex 1B	Control 3	ESC
^ 4	Hex 1C	Control 4	FS
^ 5 or ^]	Hex 1D	Control 5	GS
^ 6	Hex 1E	Control 6	RS
^ 7	Hex 1F	Control 7	US

Section 8
Composing Keys

This section explains how to create a compose sequence and provides a list of valid compose sequences for Multinational Mode.

A compose sequence allows you to create characters that do not appear on your keyboard. A compose sequence consists of a series of keystrokes and always begins with the compose character. Standard characters which follow the compose character are used to specify the composite character that is to be created.

The chart below lists the composite characters that can be created and the standard characters required to create them. Remember that for these standard characters to be used properly in the composing process they must follow the compose character.

If you are using a K2 keyboard, then your ALT key is your COMPOSE key. If you are using a K1 keyboard, which does not have an ALT key, then CTRL–SHIFT–SCROLL UP is your COMPOSE key.

Creating a Compose Sequence

To create a compose sequence:

1. Use column 1 in the following chart to locate the composite character you want to create.
2. Press the **Compose Character** (ALT if you are using a K2, K3, K4, or K5 keyboard; or CTRL–SHIFT–SCROLL UP if you are using a K1 keyboard).
3. Type the two characters from column 2 necessary for the composite character you want to create.

You may enter required characters in any order unless "order sensitive" is specified in the chart.

Valid Compose Sequences: Multinational Mode

Composite Character	Character Sequence
" (quotation mark)	" (sp)
# (number sign)	+ +
' (apostrophe)	' (sp)
@ (commercial at)	a a or A A
[(opening bracket)	((
\ (backslash)	/ / or / <
] (closing bracket)	))
^ (circumflex accent)	^ (sp)
' (single quote)	' (sp)
{ (opening brace)	(–
| (vertical line)	/ ^
} (closing brace)	) –
~ (tilde)	~ (sp)
! (inverted i)	! !
¢ (cent sign)	c / or C / or c | or C |
£ (pound sign)	l – or L – or l = or L =
Y (yen sign)	y – or Y – or y = or Y =
§ (section sign)	s o or S O or S ! or s ! or s 0 or S 0
(currency sign)	x o or X O or x 0 or X 0
© (copyright sign)	c o or C O or c 0 or C 0
a (feminine ordinal indicator)	a _ or A _
<< (angle quotation mark left)	< <
o (degree sign)	0 ^ or (sp) # or (sp) o

Composite Character	Character Sequence
± (plus/minus sign)	+ _
2 (superscript 2)	2 ^
3 (superscript 3)	3 ^
u (micro sign)	/ u or / U (order sensitive)
¶ (paragraph sign)	p ! or P !
. (middle dot)	. ^
1 (superscript 1)	1 ^
º (masculine order indicator)	o _ or O _
>> (angle quotation mark right)	> >
(fraction one–quarter)	1 4 (order sensitive)
(fraction one–half)	1 2 (order sensitive)
¿ (inverted ?)	? ?
À (A grave)	A ‘
Á (A acute)	A ’
Â (A circumflex)	A ^
Ã (A tilde)	A ~
Ä (A umlaut)	" A or A (umlaut)
Å (A ring)	A * or A o (degree sign)
Æ (A E ligature)	A E (order sensitive)
Ç (C cedilla)	C ,
È (E grave)	E ‘
É (E acute)	E ’
Ê (E circumflex)	E ^
Ë (E umlaut)	E " or E (umlaut)
Ì (I grave)	I ‘

Composite Character	Character Sequence
I (I acute)	I '
I (I circumflex)	I ^
I (I umlaut)	I " or I (umlaut)
N (N tilde)	N ~
O (O grave)	O ‘
O (O acute)	O '
O (O circumflex)	O ^
O (O tilde)	O ~
Ö (O umlaut)	O " or O (umlaut)
OE (O E ligature)	O E (order sensitive)
U (U grave)	U ‘
U (U acute)	U '
U (U circumflex)	U ^
Ü (U umlaut)	U " or U (umlaut)
Y (Y umlaut)	Y " or Y (umlaut)
ß (German small sharp s)	s s
a (a grave)	a ‘
a (a acute)	a '
a (a circumflex)	a ^
a (a tilde)	a ~
ä (a umlaut)	a " or a (umlaut)
å (A ring)	a * or a o (degree sign)
ae (a e ligature)	a e (order sensitive)
ç (c cedilla)	c ,
è (e grave)	e ‘
é (e acute)	e '

Composite Character	Character Sequence
e (e circumflex)	e ^
e (e umlaut)	e " or e (umlaut)
i (i grave)	i ‘
i (i acute)	i ’
i (i circumflex)	i ^
i (i umlaut)	i " or i (umlaut)
n (n tilde)	n ~
o (o grave)	o ‘
o (o acute)	o ’
o (o circumflex)	o ^
o (o tilde)	o ~
ö (o umlaut)	o " or o (umlaut)
oe (o e ligature)	o e (order sensitive)
Ø (o slash)	o /
u (u grave)	u ‘
u (u acute)	u ’
u (u circumflex)	u ^
ü (u umlaut)	u " or u (umlaut)
y (y umlaut)	y "

Section 9
Transmitting Files and Receiving Files

This section explains the file transmit facility and the file receive facility.

File Transmit

The VT220 Emulator provides a file transmit facility that allows you to transmit files from a CTOS workstation to a host or transmit files from a CTOS workstation to another CTOS workstation. The file transmit facility makes the file appear as input to the host.

To initiate the file transmit facility, use the following procedure:

1. You must notify the host to redirect the input. For example, on a UNIX system, you would type *cat > xxxx* (where xxxx will be the filename on the host) and press the RETURN key.
2. Press CODE–SHIFT–T.
3. The file transfer screen shown in Figure 9–1 will be displayed and you will be prompted for the name of the file you wish to send.
4. Once you have filled in the information, press the GO key to transmit the file.

   Notes:

   1. During transmission, the file transmit facility displays the number of bytes and lines sent to the host.

   2.To abort the file transmit an any time, press the CANCEL key.
5. When finished, you must stop the redirection of input on the host and close the file. For example, to stop redirection on a UNIX system, you would enter CTRL–D.

The file now resides on the remote host.

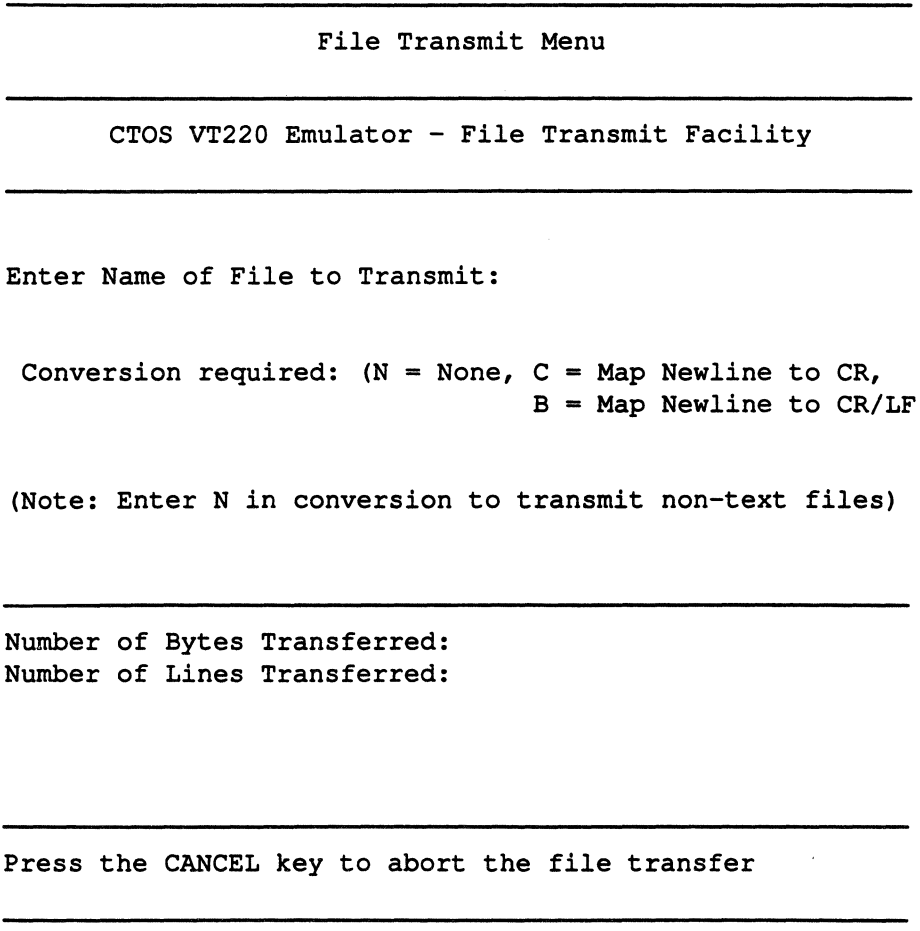
File Transmit Menu
CTOS VT220 Emulator - File Transmit Facility
Enter Name of File to Transmit:
Conversion required: (N = None, C = Map Newline to CR,
B = Map Newline to CR/LF
(Note: Enter N in conversion to transmit non-text files)
Number of Bytes Transferred:
Number of Lines Transferred:
Press the CANCEL key to abort the file transfer

Figure 9–1. File Transmit Facility Screen

File Receive

The VT220 Emulator also provides a file receive facility to receive files from a host to a CTOS workstation or to receive files from a CTOS workstation to a another CTOS workstation.

Note: *The file receive facility does not filter any of the character strings. Also, the file receive facility does no translation of the filtering.*

To initiate the file receive facility, use the following procedure:

1. You must type the command to list the file on your screen. For example, on a UNIX system, you would type *cat xxxx* (where xxxx is the filename).

   Do **not** press the RETURN key.

2. Press CODE–SHIFT–COPY.
3. Press the RETURN key to initiate the file receive.
4. When your file receive is complete, press the COPY key to close the received file.

The file receive utility can either print directly to a printer, a spooler file, a GPS file, or a user file. You may select the file name, device name, or queue name in the configuration screen (press CODE–HELP to obtain the configuration screen).

Section 10
File Transfer

The VT220 Emulator has a file transfer utility which uses the well known XModem and Kermit protocols. The file transfer utility operates as a foreground task with which you can upload and download files between a CTOS workstation and a remote host.

Running File Transfer

File transfer should be started by executing the program that implements the XModem or Kermit protocol on the remote host. When the remote host indicates that it is ready, press CODE–SHIFT–X.

The following screen is displayed and you may enter your file transfer choice.

```
CTOS VT220 Emulator - File Transfer Menu

        1. XModem DownLoad
        2. XModem UpLoad
        3. Kermit DownLoad
        4. Kermit UpLoad

        Enter your choice:

Press GO to invoke, CANCEL to dismiss the File Transfer
```

Figure 10–1. VT220 Emulator File Transfer Screen

When you press the GO key, another screen will be displayed depending on your choice in the File Transfer screen. You may return to the emulator at any time by pressing the CANCEL key.

Download/Upload using XModem Protocol

The screen in Figure 10–2 is displayed for both downloading and uploading using XModem protocol.

Note: *Use "CTS" Line Control,* ***not*** *Xon or Xoff.*

```
 CTOS VT220 Emulator - File Transfer - XModem (Field 1)

File Name:
Overwrite [Y/N] (def=N) (only during downloading)      :
NewLine Mapping [1.Binary 2.CR 3. CR/LF (def=binary)] :
CTOS Specific file (Y = Run or WP files, def = N)      :
PCWordstar File (Y/N def=N) (only during downloading) :

Press GO to invoke, CANCEL to Abort the File Transfer

_________________ File Transfer Status

File Size  : _____  Bytes Count: _____  NAKs by host:
Block Check: _____  Block Count: _____  NAKs by VTE :
                                        % Completed :
Transfer Time:
```

Figure 10–2. VT220 Emulator File Transfer (XModem) Screen

The following list describes the File Transfer (XModem) screen parameters:

Parameter	Description
Field 1	Displays either "Download" or "Upload" depending on the choice you made in the file transfer main menu.

Parameter	Description
File Name	If uploading, enter the local filename to be sent. If the filename does not exist, a message *File does not exist* is displayed and you can correct the filename. If downloading, enter the local destination filename. In either mode, you may enter a path name along with the filename; otherwise the default path is used.
Overwrite (default = N)	This field is accessible only during downloading. If the filename entered already exists, "Y" will overwrite the file; "N" will display a message, *File already exists* and position the cursor in the File Name field. You may change the filename.
NewLine Mapping	Binary: Transfers the file exactly "as is" in either direction. CR: While uploading, the CTOS System's RETURN (0Ah) will be changed to CR (0Dh). While downloading, CR (0Dh) will be changed to the CTOS System's RETURN (0Ah). CR/LF: While uploading, the CTOS System's RETURN (0Ah) will be changed to CR/LF (0Dh 0Ah). While downloading, CR/LF (0Dh 0Ah) will be changed to the CTOS System's RETURN (0Ah).

Parameter	Description
CTOS Specific File	Use this option only when transferring a CTOS run file or a word processing file between two workstations both running the VT220 Emulator R2.0 or one workstation running CTOS Asynchronous Terminal Emulator (ATE), and specify "Y" in this field. If set to "Y", the exact file size will be transferred. Otherwise, the transferred file size will be a multiple of 128 *padded* with Hex 1A.
PCWordstar File	In some word processing files, attribute information is stored in the upper bits of some of the bytes. Specifying "Y" will *strip* all the attribute information from a byte, and only the ASCII character will be retained.

File Transfer Status for XModem Protocol

The screen shown in Figure 10–2 also displays fields regarding the status of the file transfer. These values are shown when the file transfer starts. The parameters are described below:

Parameter	Description
File Size	Size of the file being uploaded. This field will be blank during downloading.
Block Check	Error checking method used. (CHECKSUM / CRC)
Bytes Count	Count of bytes transferred.
Block Count	Count of blocks transferred.
% Completed	Percentage of file uploaded. This field will be blank during downloading.
NAKs by host	Number of NAKs received from the remote host.

Parameter	Description
NAKs by VTE	Number of NAKs sent to the remote host by the VT220 Emulator.
Transfer Time	Time taken to transfer the file.

After the file transfer is complete, the message *File Transfer is complete* is displayed and you may return to the emulator by pressing the CANCEL key.

Download/Upload using Kermit Protocol

The screen shown in Figure 10–3 is displayed for both downloading and uploading using Kermit protocol.

```
 CTOS VT220 Emulator - File Transfer - Kermit (Field 1)

NOTE: File Name spec can be entered ONLY during UPLOAD
File Name(s):

NewLine Mapping [1.Binary 2.CR 3. CR/LF (def=binary)] :
PC Wordstar file ? (def=N) (only during download)     :

  Press GO to invoke, CANCEL to abort the File Transfer

                  File Transfer Status

File Name    :                      File Size  :
File No      :                      Bytes Count:
Block Check  :                      NAKs by VTE:
NAKs by host :
Transfer Time:
```

Figure 10–3. VT220 Emulator File Transfer (Kermit) Screen

The following list describes the File Transfer (Kermit) screen parameters:

Parameter	Description
Field 1	Displays either "Download" or "Upload" depending on the choice you made in the file transfer main menu.
File Name	This field can only be entered during an upload. You may enter a path name along with the local filename; otherwise the default path will be used. If the filename you enter does not exist, an error message will be displayed and you will be allowed to change the filename. You may enter more than one filename, since Kermit is capable of transferring more than one file during a single session. Filenames can be wildcarded. While downloading, the filenames will be given by the sender. Thus, you will not be able to access this field. All the files received will be placed in the default path. If the file already exists, a new file will be created by appending a "$" at the end of the downloaded filename. For example, if the name of the downloaded file is "Welcome.Txt", it will be stored as "Welcome.Txt$". If the name of the downloaded file is "Welcome.Txt$", it will be stored as "Welcome.Txt$$" and so forth. This convention avoids overwriting files.

Parameter	Description
NewLine Mapping	Binary: Transfers the file exactly "as is" in either direction. CR: While uploading, the CTOS System's RETURN (0Ah) will be changed to CR (0Dh). While downloading, CR (0Dh) will be changed to the CTOS System's RETURN (0Ah). CR/LF: While uploading, the CTOS System's RETURN (0Ah) will be changed to CR/LF (0Dh 0Ah). While downloading, CR/LF (0Dh 0Ah) will be changed to the CTOS System's RETURN (0Ah).
PCWordstar File	In some word processing files, attribute information is stored in the upper bits of some of the bytes. Specifying "Y" will **strip** all the attribute information from a byte, and only the ASCII character will be retained.

File Transfer Status for Kermit Protocol

The above screen also displays fields regarding the status of the file transfer. These values are shown when the file transfer starts. The parameters are described below:

Parameter	Description
File Name	Name of the file being transferred.
File No.	Number of the file being transferred.
File Size	Size of the file being uploaded. This field will be blank during downloading.
Block Check	Error checking method used. (1 BYTE CHECKSUM / 2 BYTE CHECKSUM / 3 BYTE CRC)

Parameter	Description
Bytes Count	Count of bytes transferred.
NAKs by host	Number of NAKs received from the remote host.
NAKs by VTE	Number of NAKs sent to the remote host by the VT220 Emulator.
Transfer Time	Time taken to transfer the file.

After the file transfer is complete, the message *File Transfer is complete* is displayed and you may return to the emulator by pressing the CANCEL key.

Transfer File Size

The CTOS VT220 Emulator File Transfers do not impose any restriction on the size of the file transferred. The size is only restricted by the availability of disk space on the remote host during upload and on the CTOS workstation during download. If there is any problem with the disk space during downloading, the message *Insufficient Disk Space* will be displayed along with the error code received. Please refer to the *CTOS Status Codes Reference Manual* for the interpretation of the error code value.

Aborting File Transfer

When there is no file transfer taking place, you can press the CANCEL key to return to the emulator.

When the file transfer is taking place, the active file transfer session can be aborted by pressing the CANCEL key. You will then get the message:

Press GO to confirm abort or CANCEL to continue.

Once the current file transfer is aborted, the screen will return to the emulator.

Section 11
Printing

This section explains how to print locally from the keyboard or print under control of the host.

The VT220 Emulator supports printing initiated from the keyboard, or printing initiated from the host by means of VT220 escape sequences.

To initiate printing, press SHIFT–COPY.

Once printing has been initiated, all printable characters are stored in a print file until the file is closed. To manually close a print file, press the COPY key.

Note: *A similar function can be used to store everything received from the host. Refer to Section 9 for details.*

The VT220 Emulator can print directly to a printer, to a spooler file, to a GPS file, or to a user file. You may select the file name, device name, or queue name in the configuration screen (press CODE–HELP to obtain the configuration screen).

For details on how to use the print function for debugging and tracing, see Appendix B, "Debugging Features."

Spooler / GPS Configuration

The VT220 Emulator contains a built–in function which allows you to print either the contents of the current display or all characters received from the host. By default, all print output is sent to the print queue [Spl]. If [Spl] is not installed on your system, please refer to the *CTOS System Software Installation and Configuration Guide* for information on installing this printer queue.

You may change the default [Spl] by entering the printer name in the configuration screen. For example, you may access a GPS printer by entering the printer device name such as [Laser].

Section 12
Status and Path Name Display

This section provides information on the VT220 Emulator status–display lines and path name display feature.

Status Display

The VT220 Emulator status–display takes advantage of the fact that the CTOS workstation screen contains more lines than an actual VT terminal screen. During emulation, there is a line on the CTOS screen which delineates the end of the actual VT terminal display. Below this line are the three status–display lines. If ANSI mode is used (25 lines), then the last line of the status display is suppressed.

The status line display shows the following information:

```
                CTOS VT220 Emulator Status Display
```

```
                                                  Path: {Node}[Sys]<Sys>VTE>
Pos=01/01 Wrap=Y Echo=Y Curs=Y InsM=N VT52=N Thu Aug 15, 1991 11:47 AM
Scr=01/24 KeyP=N NewL=N Grap=N Prnt=N CurS=N
Led=NNNN  GoOk=N Locl=N SFks=N CrFk=N Mode=R
```

Figure 12–1. VT220 Emulator Status Display Screen

Indicator	Description
Pos	The current cursor position (row, column)
Scr	The scrolling Region (top row, bottom row)
Led	Simulated LEDs (not used)
Wrap	Autowrap mode on/off
KeyP	Keypad on/off
GoOk	GO key as ESCAPE key enabled/disabled
Echo	Local Echo mode on/off
NewL	New Line mode CR/LF/CRLF
Locl	Local mode on/off
Curs	Cursor Display mode
Grap	Graphics set on/off
SFks	Function keys saved (restore possible)
InsM	Insert mode on/off
Prnt	Printing on/off
CrFk	Auto carriage return after function keys on/off
VT52	Set to Y if VT52 Mode is enabled
CurS	The type of cursor movement is enabled
Mode	Indicates the type of connection (R=RS–232, X=X.25, T=TCP/IP)

The current date and time are shown on the right side of the status display and below the default path name.

If printing is in progress, the message *Printing (Copy to close)* is displayed below the date and time. You can close the file by pressing the COPY key.

If a message is available from the mail facility, the emulator displays an indicator below the date and time. This indicator message shows whether the message is urgent or normal. Various messages may also appear in this status area.

The status–display may be turned off or reduced to the separator line and the date/time display, by means of the configuration screen.

Changing the Default Path Name

You may wish to change the default path name from within the VT220 Emulator. This can be done by pressing CODE–SHIFT–V. The screen shown in Figure 12–2 is displayed with the default entries:

```
                    CTOS VT220 Emulator

                    Change Path Screen

Volume                      Sys
Directory                   CtVt
Default File Prefix
Password                    ########
Node


(Press CANCEL to dismiss, GO to change the current path)
```

Figure 12–2. VT220 Emulator Change Path Screen

You can change the path by altering these entries and then pressing GO. If the CANCEL key is pressed, the changes will be ignored and the screen will return to the emulator without changing the path.

The *Volume* and *Directory* fields cannot be left blank. If the other fields are left blank, the values for these fields will be changed to blank.

Appendix A
Status Codes

This appendix provides information on listing and defining CTOS, X.25, and TCP/IP error codes. This appendix also provides suggestions for correcting errors.

The following is a list of known status codes for the CTOS VT220 Emulator:

Communication Port in Use (08401)

The communication port you want to use may be in use by another program such as the Print Spooler or GPS subsystem.

Invalid Port Specification (00060)

The specified port does not exist. Check your CTOS configuration.

Cannot use X.25 – Unknown or Invalid Configuration File (02344)

The specified configuration file does not exist. Check the files located in the <CtVt> directory.

Cannot use X.25 – Cannot use Virtual Circuit (02350)

The X.25 Gateway cannot open the requested connection (for example, the called address or called number does not exist or is busy). Use the X25 Status command to determine the reason for the failure.

Cannot use X.25 – X.25 Server not installed (00033)

The X.25 Gateway is not installed and you have requested that an X.25 connection be established. Install the X.25 Gateway software and try again.

Cannot open Printer Port (00905)

The direct printer port or the communication channel you are trying to use for printing is already in use by the Spooler or by GPS.

This usually happens when you try to print to [LPT] or [PTR]B devices and these devices are also configured in the Spooler.

TCP/IP Server Not Installed (00033)

The TCP/IP server is not installed. Install the server and try again.

Time Out Opening TCP/IP Call (58972)

TCP timed out trying to open the connection. Make sure the requested host is configured into TCP.

If you receive an unknown error code, please see the *CTOS Status Codes Reference Manual*.

Appendix B
Debugging Features

This appendix provides information on how to run the VT220 Emulator debugging features.

Input and Output Line Monitor

The CTOS VT220 Emulator maintains a back screen where the last 2000 input and output characters are saved.

To display the line monitor screens use the following keys:

Key	Description
CODE–SHIFT–I	The last 2000 input characters are shown. Pressing any key will cause the emulator to return to the normal display. The last character received is displayed on the bottom right–hand corner of the screen. The escape key is highlighted in reverse video.
CODE–SHIFT–O	The last 2000 output characters are shown. Pressing any key will cause the emulator to return to the normal display. The last character sent is displayed on the bottom right–hand corner of the screen. The escape key is highlighted in reverse video.

Key	Description
CODE–; or CODE–SHIFT–:	Clears the input and output character buffers.

Parity, Overrun and Framing Error Detection in Line Monitor

The line monitor display shows all parity, overrun, and framing errors as the [<>] character.

Parity errors normally occur when two communicating systems are configured with different parity. Parity errors can also occur if the connection between the two systems is not reliable.

Overrun errors occur when the input buffer on the receiving system is full and more characters are being sent by the sending system.

Framing errors occur if the number of stop bits or the length of a character is configured differently on each of the two communicating systems.

Display of Last Escape Sequence and Last Function Key Sequence

You can display the last escape sequence sent to the host, or received from the host, as well as the last function key sequence sent to the host.

To initiate this display, press CODE–SHIFT–D.

To dismiss the display and continue the emulation, press any key.

Transmit and Receive Count

To initiate count use the following keys:

Key	Description
CODE–SHIFT–2	Turns on the X.25 or TCP/IP debugging features. The number of bytes sent to or received from the transport are shown.
CODE–SHIFT–3	Turns on the RS–232 debugging feature. The number of bytes sent or received are shown one byte at a time.

Tab Rack Display

You can also display the current tab rack, which shows where the tab positions are currently set.

To initiate the display, press CODE–SHIFT–9.

To dismiss the display and continue the emulation, press any key.

Tab positions may be altered by the host, and the cursor may be moved around tab positions by special escape sequences sent from the host.

Print Trace

The printing function may be used to create a CTOS file which contains all printable ASCII characters sent to the host, or received from the host. All escape sequences and control characters are eliminated because they are not printable characters.

This feature may be used to keep a complete log of all actions initiated and all output received.

To start the print trace:

1. Press CODE–HELP.
2. Enter (in the Capture File Field) the name of the CTOS file in which the information should be stored.
3. Press SHIFT–COPY to start the printing process.
4. Enter anything you wish to trace.
5. Press the COPY key to stop the trace.

In the CTOS environment, this file can then be edited, searched, or printed.

Keyboard Input Display

You can display the hexadecimal value of each keyboard input.

To initiate this display, press CODE–BACKSPACE.

The display is shown on the bottom right–hand corner of the screen in the following format:

####/####

The first field shows the character code in hexadecimal notation as returned from the keyboard handler. The second field shows the hexadecimal character displayed.

Appendix C
Cabling

For modems, use standard (male to male) modem cables.

For direct connection, both 25 pin to 25 pin cables and 15 pin to 25 pin cables, see the following chart.

Cross–Over Cable – 4 Wires

25–Pin Connector	Pin Name	25–Pin Connector
1	Ground	1
2	Transmit	3
3	Receive	2
7	Signal Ground	7
4 to 5	Local Loop	4 to 5
6 to 8 to 20	Local Loop	6 to 8 to 20

15–Pin Connector	Pin Name	25–Pin Connector
1	Ground	1
2	Transmit	3
3	Receive	2
7	Signal Ground	7

Appendix D
Screen Information

This appendix explains standard ANSI screen characteristics and color.

Display Intensities

The VT220 Emulator supports the following display intensities:

Function	Intensity Number
Normal	0
Bright	1
Underline	4
Blink	5
Inverse	7
Bold	8
Struck Through	9

Several of these intensities can be assigned at the same time with the standard ANSI escape sequence *Esc*[*p0;p1;p2...pn*m*. For example, the sequence *Esc[4;7m* would set underline and inverse for all the characters until the mode is reset.

Color

The VT220 Emulator supports the use of colors on CTOS systems with a color screen and a graphics slice attached. ANSI standard color codes are supported only in ANSI mode. They are:

Color	Color Code
Black	30
Red	31
Green	32
Yellow	33
Blue	34
Magenta	35
Cyan	36
White	37

For example, *ESC[32m* would change text color to green. Extended ANSI color codes (8 through 15) are also accepted, but are mapped to color codes 0 through 7.

Note: *Black has been implemented as White, because the graphics slice does not support two color reverse video, thus Black would not be properly displayed.*

Changing the Screen Color

The VT220 Emulator loads its own color palette in the following file: **<CtVt>Vt.Colour**

The default screen color depends in which directory you are working. If you are working in the <CtVt> directory, the default color is green/yellow. If you are working in any other directory, the Vt.Colour file will not be found. Thus the internal default color is green/white. You may copy the <CtVt> Vt.Colour file to any directory to change the default color.

Using the standard BTOS editor, you have the option to change the screen color by editing a copy of the Vt.Colour file in your directory. This file contains eight bytes, each represented by a hexadecimal number. The first hexadecimal number represents the foreground color. The second hexadecimal number represents the background color. Use **Code–i** to insert the hexadecimal number in the text (after the <).

Here is a list of common colors and their hexadecimal value.

Color	Hexadecimal value
Black	00
Blue	03
Light Blue	0F
Green	0C
Chartreuse	09
Bright Green	1D
Olive	18
Orange	34
Pink	33
Purple	23
Red	30
Maroon	20
Yellow	3C
White	3F

Appendix E
Escape Sequences

This appendix provides charts that list the CTOS VT220 Emulator escape sequences.

VT52 Escape Sequences

Escape Sequence	Function
ESC A	Cursor Up
ESC B	Cursor Down
ESC C	Cursor Right
ESC D	Cursor Left
ESC F	Enter graphics mode
ESC G	Exit graphics mode
ESC H	Cursor to home
ESC I	Reverse Line Feed
ESC J	Erase to end of screen
ESC K	Erase to end of line
ESC Y Line Column	Direct cursor address
ESC Z	Identify
ESC =	Enter alternate keypad mode
ESC >	Exit alternate keypad mode

VT220 Escape Sequences

Escape Sequence	Function
ESC [	CSI – Control Sequence Introducer
ESC =	DECKPAM – Select Application Keypad
ESC >	DECKPNM – Select Numeric Keypad
ESC <	Select Terminal Type = VT100
ESC 8	DECRC – Restore cursor
ESC 7	DECSC – Save cursor
ESC c	RIS – hard reset
ESC \	Device Control String Terminator
ESC P	Device Control String
ESC M	RI – Reverse Index
ESC H	HTS – Horizontal Tab Set
ESC E	NEL – Next Line
ESC D	IND – Index
ESC Z	DECID – Ignored
ESC # 3	DECDHL – Top of Double High Character – ignored
ESC # 4	DECDHL – Bottom of Double High Character – ignored
ESC # 5	DECSWL – Single width line – ignored
ESC # 6	DECDWL – Double width line – ignored
ESC # 8	DECALN – fill frame with "E"s
ESC ! p	DECSTR – Soft Terminal Reset

Escape Sequence	Function
ESC (	Specify G0 Character Set
O	Set Graphics
A	Clear Graphics
B	Clear Graphics – ASCII Character Set
ESC)	Specify G1 Character Set
O	Set Graphics
A	Clear Graphics
B	Clear Graphics – ASCII Character Set
ESC [@	ICH – Insert Character
ESC [A	CUU – Cursor Up
ESC [B	CUD – Cursor Down
ESC [C	CUF – Cursor Forward
ESC [D	CUB – Cursor Backward
ESC [E	NEL – Next Line
ESC [F	CPL
ESC [G	CHA
ESC [H	CUP – Cursor Position
ESC [I	CHT
ESC [J	ED – Erase in Display
ESC [K	EL – Erase Line
ESC [L	IL – Insert Line
ESC [M	DL – Delete Line
ESC [P	DCH – Delete Character

Escape Sequence	Function
ESC [S	SU
ESC [T	SD
ESC [X	ECH – Erase Character
ESC [Z	CBT
ESC [> ESC [~	Load function keys
ESC [a	HPR
ESC [c	ANSI 3.64: DA
ESC [d	VPA
ESC [e	VPR
ESC [f	HVP – Horizontal and Vertical Position
ESC [g	ANSI 3.64: TBC – Tabulation Clear
ESC [n	ANSI 3.64: DSR
ESC [q	DECLL – Set Keyboard LEDs
ESC [r	DECSTBM – Set Top and Bottom Margins
ESC [x	DECREEPTPARM – Report terminal parameters

Escape Sequence	Function
ESC [*X* i	ANSI 3.64: MC
X = ? 5	Auto Print Mode on – open the output device and prints the print header
? 4	Auto Print Mode off – closes the output device
5	Print Controller on – open the output device and prints the print header
4	Print Controller off – closes the output device
2	Transmit the screen data up to the cursor position
0	Send the full screen to the printer
?	Print Cursor Line
ESC [*X* h	ANSI 3.64: SM – Set Mode
X = ? 1	DECCKM – Cursor Key – Application
2	KAM – Keyboard – Locked
4	IRM – Insert
? 5	DECSCNM – Screen – Reverse
? 6	DECOM – Origin
? 7	DECAWN – Autowrap – On
? 8	DECARM – Autorepeat – On
12	SRM – Send/Receive – Off
? 18	DECPFF – Print Form Feed – On
? 19	DECPEX – Print Extent – Full Screen
20	LNM – New Line
? 25	DECTCEM – Text cursor enable – On
? 42	DECNRCM – Character Set – National

Escape Sequence	Function
ESC [*X* l	ANSI 3.64: RM – Reset Mode
X = ? 1	DECCKM – Cursor Key – Cursor
2	KAM – Keyboard – Unlocked
4	IRM – Replace
? 5	DECSCNM – Screen – Normal
? 6	DECOM – Absolute
? 7	DECAWN – Autowrap – Off
? 8	DECARM – Autorepeat – Off
12	SRM – Send/Receive – On
? 18	DECPFF – Print Form Feed – Off
? 19	DECPEX – Print Extent – Scrolling region
20	LNM – Line Feed
? 25	DECTCEM – Text cursor enable – Off
? 42	DECNRCM – Character Set – Multinational

Escape Sequence	Function
ESC [*X* m	ANSI 3.64: SGR
X = 0	All attributes off
1	Bold
2	Dim
4	Underlined
5, 6	Blink
7	Reverse
9	Struck through
22	Normal Intensity
24	Not Underlined
25	Not Blinking
27	Not Reverse
29	Not Struck Through
30, 40	Black
31, 41	Red
32, 42	Green
33, 43	Yellow
34, 44	Blue
35, 45	Magenta
36, 46	Cyan
37, 47	White

Appendix F
Kermit Protocol

This appendix provides background information on the well known Kermit protocol.

Origin

Kermit is a packet oriented protocol developed by Frank da Cruz and Bill Catchings at Columbia University in 1981. The protocol was named after Kermit the frog, star of *The Muppet Show*. They were inspired by a Muppets calendar on the wall when they were trying to choose a name for this protocol. Also, *kermit* is the Celtic word meaning *free*.

The Kermit protocol encompasses just about every imaginable communication style and file organization. The Kermit protocol has been modified for the CTOS VT220 Emulator to do file transfer to or from a CTOS workstation.

The Kermit Packet

Kermit transfers data by breaking it up into pieces and encapsulating the pieces within *packets*. Kermit can transfer more than one file in one file transfer session. Parameters such as the error checking method, buffer size, time out, and retries are negotiated between the two systems by exchanging the Send–Init packet which is the first packet sent and received.

The basic Kermit Packet looks like this:

[Mark] [Len] [Seq] [Type] [...Data...] [Check] <terminator>

|<———included in Check———>|

|<———Len–32 characters———>|

Packet	Description
Mark	A real control character, usually CTRL–A
Len	One byte, length of the remainder of the packet + 32, maximum is 95
Seq	One byte, packet sequence number + 32, modulo 64
Type	One byte, an upper case character, means type of the packet
Check	One, two, or three bytes as negotiated
<Terminator>	Any Control character required for reading the packet

The Kermit Protocol

The following section is taken from Frank da Cruz's book titled, "Kermit: A File Transfer Protocol," published by Digital Equipment Corporation, 1987.

The basic Kermit protocol takes place over a "transaction." Every transaction is independent of every other transaction. The transaction is driven by the file sender; the file receiver simply acknowledges each packet it gets. The packets are short–96 characters at most–and each party waits for a packet from the other before sending the next packet. Thus, Kermit is a "stop–and–wait" protocol. Each packet is checked for errors, and retransmission takes place whenever an error is detected. Data is encoded within packets for maximum transparency through communication equipment and host console terminal drivers.

The following chart lists the basic Kermit packet types:

Type	Description
S	Send Initiation. I'm about to send files, and here are my parameters.
F	File Header. The name of the file which is about to come.
D	File Data.
Z	End of File.
B	Break Transmission. End of transaction
Y	Acknowledgment.
N	Negative Acknowledgment.
E	Fatal Error.

The transaction begins when the file sender transmits a Send–Initiation packet to indicate that files are coming. This is followed by a File–Header packet, in which the sender tells the receiver the name of the file that is to come. Then come as many Data packets as are necessary to transfer the contents of the file, a Z packet at the end of the file (EOF), and finally a B packet to indicate that the transaction is finished. The File–Header/Data/EOF sequence can be repeated for each file to be sent within the transaction.

Let's restate all this in a more compact notation, in which each letter means a packet of the indicated type together with its acknowledgment, parentheses are used for grouping, and the character "*" means zero or more repetitions of the preceding quantity:

S (F D* Z)* B

If you ever studied formal languages, this notation will be familiar to you. It is used to write a class of grammars called "regular expressions." A regular expression can be recognized by a "finite state automation" (FSA). This FSA will recognize (or produce) all strings of the form "S (F D* Z)* B" including SB, SFZB, SFDDDDZB, SFDDDDDDZFZFDDZB, and so forth–all legal Kermit transactions.

Appendix G
XModem Protocol

This appendix provides background information on the well known XModem protocol.

Origin

XModem is a block–oriented, error–checking protocol released into the public domain by its creator, Ward Christensen. This protocol is very popular on electronic bulletin board systems.

The XModem protocol has been modified for the CTOS VT220 Emulator to do file transfer to or from a CTOS workstation.

The XModem Packet

XModem transfers only a single file at a time. The protocol uses two–way communications, and either a CHECKSUM or cyclic redundancy check (CRC) for error–checking. XModem can handle text or executable files with over 99% accuracy. The CTOS VT220 Emulator supports and automatically adjusts for both the CHECKSUM and CRC variants.

The XModem protocol is defined such that CRC checking is always attempted first. If CRC is not acknowledged by the sender, then the CHECKSUM method is used. XModem requires file transfers to be performed with 8 data bits, 1 stop bit, and no parity.

The XModem Packet looks like this:

[SOH] [seq] [cmpl seq] [128 data bytes] [csum]

Packet	Description
SOH	Start of header character (decimal 1).
seq	One byte sequence number which starts at 1, and increments by one until it reaches 255, and then wraps around to zero.
cmpl seq	One byte 1's complement of seq. This can be calculated as cmpl = 255 – (255 and seq) or by using xor as cmpl = (255 and seq) xor 255.
data	128, 8 bit bytes of data. Note than when sending CP/M and MS/DOS files a ^Z (decimal 26) must be added to the end of the file. If the last block of data is less than 128 bytes, the XModem packet must be padded with characters, usually ^Z's.
csum	One byte sum of all of the data bytes where any overflow or carry is discarded immediately. For example, if the first 3 bytes are 255, 5, and 6, the CHECKSUM after the first 3 bytes will be 10.

Each block of the transfer in CRC mode looks like this:

[SOH] [blk #] [255–blk #] [—128 data bytes—] [CRC hi] [CRC lo]

Packet	Description
SOH	01 hex
blk #	The binary number, that starts at 01, increments by 1, and wraps 0FFH to 00H (not to 01)
255–blk #	The ones complement of blk #.
CRC hi	The byte containing the 8 high order coefficients of the CRC.
CRC lo	The byte containing the 8 low order coefficients of the CRC.

The XModem/CRC Protocol

Current XModem/CRC protocol can use a two character CRC–16, instead of the one character arithmetic checksum (BCC) used by the original protocol and by most commercial implementations. CRC–16 guarantees detection of all single and double bit errors, all errors with an odd number of error bits, all burst errors of length 16 or less, 99.9969% of all 17–bit error bursts, and 99.9984% of all possible longer error bursts. By contrast, a double bit error, or a burst error of 9 bits or more can sneak past the XMODEM protocol arithmetic checksum.

The XMODEM/CRC protocol is similar to the XMODEM protocol, except that the receiver specifies CRC–16 by sending 'C' (Hex 43) instead of NAK when requesting the FIRST block. A two byte CRC is sent in place of the one byte arithmetic checksum (BCC).

Appendix H
Help

This appendix describes the on–line help facilities.

Help is available any time the main terminal display screen is shown during the emulation. On–line help cannot be accessed while other forms, such as the configuration form or the file transfer form , are displayed.

To obtain help information, press SHIFT–HELP.

There are ten pages of help information for the emulator.

To page through the help screens, press NEXT PAGE to advance one page and press PREV PAGE to go back one page.

Alternatively, you may access every help screen by entering the page number (0–9) of that screen. Page numbers must be entered from the main keyboard. The first help screen (page 0) is an index of the other nine help screens.

To terminate the help display, press the CANCEL key.

The next ten pages **represent** the information found on the on–line help screens. These pages will not appear exactly like the on–line help screens because of the width of the manual's pages.

Help Index Screen **Page 0**

Help Information is provided as follows:

Help Page 0 - Index (This Page.)
Help Page 1 - CTOS Special Keys provided on CTOS Keyboard.
Help Page 2 - Special Keys in ANSI Mode.
Help Page 3 - VT100 Function Keys.
Help Page 4 - VT220 Function Keys.
Help Page 5 - VT100 & VT220 Keypad Keys.
Help Page 6 - Control Keys Usages.
Help Page 7 - Erase/Insert/Print Keys.
Help Page 8 - Utility Keys.
Help Page 9 - Special K1 Keyboard Keypad Keys.

Press the Next Page or Prev Page Keys to browse through the help information, or enter the page number.
or press the CANCEL key to dismiss help.

Special CTOS Keys **Page 1**

CTOS Key	Description
Finish	Terminate the Emulator unless in ANSI Mode
Shift-Finish	Terminate the Emulator in all modes
Code-Finish	Terminate the Emulator in all modes
Code-Shift-Finish	Clear the Call (Disconnect Line) and enters Configuration screen
Code-Mark	Send a BREAK signal (RS232 only)
Cancel	Send ESC character (VT100 and VT220 only)
Shift-Cancel	Clear Screen and move cursor to Home
Code-Shift-Cancel	Clear Screen, Reset Terminal and move cursor to home
Help	Display Help Info (ANSI and VT100)
Shift-Help	Display Help Info (All modes)
Code-Help	Display Configuration Screen
Code Shift Q	Load a Function Key file from Disk
Code Shift T	File Transmit Screen
Code Shift F	Function Key definition Screen (VT100 and VT220 only)
Code Shift B	Clear all User Function Key values
Code Shift S	Save current User Function Key values
Code Shift R	Restore User Function Keys previously saved
ALT or Code-Shift-Sc-Up	COMPOSE character key (DEC International only)

Special Keys in ANSI Mode **Page 2**

CTOS Key	Description
Finish	Sends EOT character (Control&D)
Cancel	Sends ESC [H
Mark	Sends ESC [W
Bound	Sends STX character (Control&B)
Move	Sends ' character (single quote)
OverType	Sends ESC [L
Prev Page	Sends ESC [I
Next Page	Sends ESC [G
Scroll Up	Sends ESC [A
Scroll Down	Sends ESC [B
F1	Sends ESC [M
F2	Sends ESC [N
F3	Sends ESC [O
F4	Sends ESC [P
F5	Sends ESC [Q
F6	Sends ESC [R
F7	Sends ESC [S
F8	Sends ESC [T
F9	Sends ESC [U
F10	Sends ESC [V

Note: These sequences are as per ANSI definition for Xenix consoles.

VT100 Function Keys **Page 3**

CTOS Key	Description
F1 to F10	Sends the user defined function key string for F1 to F10 or sends ESC [xx ~ if no user defined sequence. (xx = 01 through 10)
Code-F1 to Code-F10	Sends the user defined function key string for F11 to F20 or sends ESC [xx ~ if no user defined sequence. (xx = 11 through 20)
Shft-F1 to Shft-F10	Sends the user defined function key string for F21 to F30 or sends ESC [xx ~ if no user defined sequence. (xx = 21 through 30)
Prev Page	Sends ESC [91 ~ to host
Next Page	Sends ESC [92 ~ to host
Scroll Up	Sends ESC [93 ~ to host
Scroll Down	Sends ESC [94 ~ to host
Page	Sends ESC [81 ~ to host
Sent	Sends ESC [82 ~ to host
Line	Sends ESC [83 ~ to host
Col	Sends ESC [84 ~ to host
Para	Sends ESC [85 ~ to host
Word	Sends ESC [86 ~ to host

Note: A carriage return character is sent after the ESC sequence if so defined in the VT100 Function Key configuration screen.

VT220 Function Keys **Page 4**

CTOS Key	Description
F1 to F5	Sends ESC [xx ~ to host (xx = 12 for F1, 13 for F2 ... 15 for F5)
F6 to F10	Sends VT220 function key F6 to F10 string to host
Code-F1 to Code-F10	Sends VT220 function key F11 to F20 string to host
Shft-F1 to Shft-F10	Sends user defined function key string for Function Key F1 to F10 to host, if available.
Code-Shift-F1 to Code-Shift-F10	Sends user defined function key string for Function Key F11 to F20 to host, if available.
Page	Sends FIND command to host (ESC [1 ~)
Sent	Sends INSERT HERE command to host (ESC [2 ~)
Line	Sends REMOVE command to host (ESC [3 ~)
Col	Sends SELECT command to host (ESC [4 ~)
Para, Prev Page	Sends PREV SCREEN command to host (ESC [5 ~)
Word, Next Page	Sends NEXT SCREEN command to host (ESC [6 ~)
Go	Sends FK16 sequence (VT220 DO key)
Help	Sends FK15 sequence (VT220 HELP key)

Note: If no user defined function keys are available then the shifted keys will not send a sequence to the host. A beep will indicate that no user defined sequence is available.

VT100/220 Keypad Keys **Page 5**

CTOS Key	Description
Keypad %	Program Function Key PF1 (ESC [P)
Keypad x	Program Function Key PF2 (ESC [Q)
Keypad /	Program Function Key PF3 (ESC [R)
Keypad -	Program Function Key PF4 (ESC [S)
Keypad 0	Keypad 0 (ESC [p)
Keypad 1	Keypad 1 (ESC [q)
Keypad 2	Keypad 2 (ESC [r)
Keypad 3	Keypad 3 (ESC [s)
Keypad 4	Keypad 4 (ESC [t)
Keypad 5	Keypad 5 (ESC [u)
Keypad 6	Keypad 6 (ESC [v)
Keypad 7	Keypad 7 (ESC [w)
Keypad 8	Keypad 8 (ESC [x)
Keypad 9	Keypad 9 (ESC [y)

Note: See Help Page 9 for details on Keypad usage on the K1 style keyboard.

Keypad +	Keypad Minus (ESC [m)
Keypad =	Keypad Comma (ESC [l)
Keypad .	Keypad Period (ESC [n)
Keypad ENTER	Keypad Enter (ESC [M)

Note: These keys are chosen to ensure same physical layout as VT100.

Note that the standard keypad characters are enabled only if the keypad is turned on. If the keypad is turned off, the above sequences can be sent by pressing the CODE key with the appropriate keypad key. The keypad is turned on or off with either the configuration screen or by escape sequences from the host.

Control Keys **Page 6**

CTOS Key	Description
Code & A	Control A (Hex 01)
" "	" "
Code & Z	Control Z (Hex 1A)
Code 2	Null (Hex 00)
Code 3	ESCAPE character (Hex 1B)
Code [	ESCAPE character (Hex 1B)
Code 4	FS character (Hex 1C)
	- Note: Ctrl&\ on many terminals.
Code 5	GS character (Hex 1D)
Code]	GS character (Hex 1D)
Code 6	RS character (Hex 1E)
Code 7	US character (Hex 1F)

Note: The control keys are insensitive to the Shift Lock key.

Erase / Insert / Print Keys **Page 7**

CTOS Key	Description
Shift-Delete	Erase to end of line
Code-Delete	Erase complete line
Shift-Code-Delete	Erase complete screen
Delete	Delete character (Hex 7F character
Delete-Char	Delete character sent to host)
Code-Shift-Dn-Arrow	Delete cursor line
Code-Up-Arrow	Insert character
Code-Shift-Up-Arrow	Insert line before cursor line

CTOS Print Keys	Description
Code-Copy	Print entire screen to file/printer
Shift-Copy	Start printing to file/printer
Copy	End printing to file/printer

Utility Keys **Page 8**

CTOS Key	Description
Code-Shift-I	Display last 2000 characters received from host
Code-Shift-O	Display last 2000 characters sent to host
Code-;	Clear Input and Output Buffers
Code-Shift-:	Clear Input and Output Buffers
Code-Shift-D	Display last Escape and Function Key sequence
Code-Backspace	Display keyboard character values
Code-Shift-2	Turn on X.25 / TCP Debugging code
Code-Shift-3	Turn on RS-232C Debugging code
Code-Shift-4	Display last VT220 Function Key string received from host
Code-Shift-6	Turn ON Keyboard Repeat (default)
Code-Shift-7	Turn OFF Keyboard Repeat
Code-Shift-9	Show current TAB settings
Code-Shift-C	Enter control character
Code-Shift-Y	Toggles between 24 & 33 lines of text in VGA Monitors
Code-Shift-V	Change Current Path
Code-Shift-X	File Transfer Utility
Code-Shift-Copy	Initiates the File Receive Facility

VT100/220 Keypad Keys **Page 9**

As the K1 keyboard does not contain a full VT100 Keypad, the following keys are used on this keyboard.

The Programmable Function Keys PF1, PF2, PF3, and PF4, as well as the special keypad keys - + . must be prefixed with the CODE-Shift-K sequence, followed by:

CTOS Key	Description
1	Program Function Key PF1 (ESC [P)
2	Program Function Key PF2 (ESC [Q)
3	Program Function Key PF3 (ESC [R)
4	Program Function Key PF4 (ESC [S)
-	Keypad Minus (ESC [m)
,	Keypad Comma (ESC [l)
.	Keypad Period (ESC [n)

All other keypad keys are as per K2 keyboard
(See page 5)

Glossary

A

American Standard Code for Information Interchange (ASCII)
A character set code consisting of 7–bit coded characters (8 bits including parity check) for information exchange among data processing systems, data communications systems, and related equipment.

ASCII
See American Standard Code for Information Interchange.

asynchronous terminal emulator (ATE)
A workstation functioning as an asynchronous terminal. Also used to describe a software package that provides this capability.

ATE
See asynchronous terminal emulator

B

baud rate
The speed of a data transmission.

binary file
A file containing a set of computer instructions reduced to a choice of two alternative conditions.

BNet
A communications application used to connect servers together.

buffer
An area of memory used as a temporary holding bin for input and output data.

C

case sensitive
Upper case and lower case letters are interpreted differently.

channel
A high–speed pathway between two devices.

character set
A set of characters stored in a terminal.

cluster
A group of workstations connected to a common server. *See also* server.

Cluster View
A software product that connects the keyboard and monitor on a cluster workstation directory to a shared resource processor such as an XE 530.

cluster workstation
A workstation connected to a server. *See also* server.

compose sequence
The sequence that generates characters that do not exist as standard keys on your keyboard.

configuration
An arrangement of parts, such as computer hardware, or of elements, such as software programs.

configuration file
Contains parameter values for a software product or hardware device.

Context Manager
A program that divides memory into multiple partitions so that more than one program can be started, and in some cases, simultaneously executed on a workstation.

control character
The single–byte code (standardized by ANSI) that performs a specific function in data communications and text processing but is not displayed on a video screen.

control code
The command that allows you to perform additional terminal functions not available using single control characters in character sets.

control function
It consists of a function name and character abbreviation (standardized by ANSI) that is used to specify how the terminal should process, send, and display characters. For example, CR is the control character abbreviation (mnemonic) for the carriage return function.

control sequence indicator
A sequence that starts with CSI (9/11), followed by one or more ASCII graphic characters.

CTOS
The open workstation operating system. Also, an umbrella term encompassing all varieties of the BTOS, CTOS, and CTOS/XE operating systems.

CTOS/XE
The operating system for shared resource processors such as the XE 530.

CTOS BNet II
A communications software program that allows users of CTOS systems to access the files and other resources of systems in remote locations. BNet II provides administration, data transfer, and link control procedures for communications between systems connected in a BNet II network.

cursor
A movable marker indicating the position of the next character inputted on the screen.

cursor position
This indicates active screen location where the next character should appear.

D

DEC
See Digital Equipment Corporation.

default directory
The directory name that appears in angle brackets (< >) in the path setting on the screen.

default path
The volume and directory that appear in the path setting on the screen. *See also* path.

default value
The predetermined value with which a command is executed when an optional field is left blank.

default volume
The volume or device name that appears in square brackets ([ ]) in the path setting on the screen.

device
A disk drive, printer, tape drive, modem, or other physical device that receives or transmits data.

Digital Equipment Corporation (DEC)
The manufacturer of the VT52, VT100, and VT220 terminals.

directory
A subdivision of disk storage space.

disk
A mass–storage device for data.

disk drive
The mechanism that holds the disk.

dollar–sign directory
A directory that stores temporary files.

E

Editor
An ASCII text editing application.

error code
A decimal or hexadecimal number denoting an error condition on a workstation or shared resource processor such as the XE 530.

escape sequence
A sequence that starts with the C0 character ESC (1/11), followed by one or more ASCII graphic characters.

Ethernet
A local are network trademarked by Xerox.

Executive
The CTOS command interpreter.

F

field
The highlighted line in a command form where a parameter value is entered.

file
A set of data that is stored and retrieved as a unit.

floppy disk drive
A slot–like opening on a workstation that holds a floppy diskette.

floppy disk
A small removable data storage disk.

format
A particular arrangement of data.

frame
A separate, rectangular area of the screen. A frame can have any desired width and height (up to those of the entire screen).

G

Generic Print System (GPS)
A set of software programs that provide printing services for CTOS applications.

graphic characters
The characters that you display on a video screen.

GPS
See Generic Print System.

H

hexadecimal number
A number in the base sixteen numbering system, which is primarily used by programmers. Hexadecimal digits are represented by numerals 0 to 9, and characters A to F.

J

JCL
See Job Control Language.

Job Control Language (JCL)
A programming language processed by the Batch facility.

K

K b
Kilobyte. 1024 bytes.

Kermit
A packet–oriented protocol developed at Columbia University that is available on many different computer systems.

M

main keypad
The keypad that consists of standard keys (used to generate letters, numbers, and symbols) and function keys (used to generate special function codes).

master
See server.

M b
Megabyte. 1,048,576 bytes.

MCS
See multinational character set.

memory
High–speed volatile data storage, the contents of which can be altered at any time. *See also* random access memory.

message file
A binary file containing the screen prompts and messages displayed by an application.

message text file
The text source file for a binary message file.

memory partition
A discrete area of memory.

module
A workstation component, such as disk drive, housed in its own casing and connected as an individual unit.

multinational character set (MCS)
An 8–bit character set created by DEC, which contains most of the characters used in the major European languages. It includes the ASCII character set.

multibyte control code
The string of characters that represent possible code combinations. This string is called an escape sequence, control sequence, or device control string.

N

network node
A server connected to BNet or CT–Net. Cluster workstations connected to a node can communicate with other network nodes.

network user
A person who uses a terminal device to connect to a host system for access to host services, or to applications available on the host. The connection may be direct, or by dial–up telephone lines. The terminal device may be a terminal emulator.

node
See network node.

numeric keypad
The keypad that consists of the alternate number and symbol keys, usually found on the right edge of the keypad.

O

operating system
A program that controls execution of other programs on the computer.

operating system configuration file
A file containing configurable operating system parameters.

OS
See operating system.

output
Data delivered from a program to a file or device.

overwrite
To replace the contents of an existing file with the contents of another file. Overwriting destroys the original file.

P

parameter
A definable element of information affecting the way a program executes.

parameter field
See field.

parameter value
An element of information supplied in a command form or a configuration file.

partition
See memory partition.

password
An access code that restricts the use of a system. Workstations or servers can have several passwords that allow varying levels of access to different users.

path
The default volume and directory. This volume and directory are used automatically when you execute a command unless you override the path with a file specification. The path setting appears in the status area of the screen.

primary partition
The memory partition containing the program that is currently active on the workstation or shared resource processor.

processor
The unit that interprets and executes instructions.

protected mode
A program or operating system that can use memory above the first megabyte.

R

RAM
See random access memory

random access memory (RAM)
A high–speed storage area where data is loaded prior to processing. The contents of memory are volatile and can be altered at any time. After processing, data is written back to the disk for permanent storage.

real mode
A program or operating system that runs in the first megabyte of memory.

read access
The ability to open or process a file, but not to make changes to it.

release documentation
A document containing information about a new version of a software product. Sometimes called Release Notes, Release Notice, or Release Information File.

run file
An executable program.

S

scratch volume
A disk used for storage of temporary files created by some applications.

SCSI
Small Computer Standard Interface. It provides a design standard for hardware device interface.

sector
512 bytes of data.

server
A workstation or shared resource processor, sometimes called a *master*, to which cluster workstations are connected. The server controls many system resources, such as printing and communications. Co–workers can share the files and applications that are stored on disks located on the server.

set–up state
The state of operation for a VT220 terminal in which you can select or examine terminal operating functions or select the on–line or local state.

shared resource processor
A multiprocessor computer that is always used as a server.

source code
The text of a programming language, before it is compiled and linked to form an executable program.

Standard Software
A set of programs, configuration files, and commands that are required to configure the system and perform basic operations.

status area
Where the default path, user name, and date/time information are displayed.

status code
A number designating a certain condition on the system. In many cases, status codes represent errors. In other cases, they represent a normal operating condition.

system service
A program that expands the capabilities of the operating system.

T

TCP/IP
See Transmission Control Protocol/Internet Protocol.

TeleCluster
The method of connecting workstations to a server via telephone cabling.

terminal mode
One of several operating states used by the terminal.

Transmission Control Protocol/Internet Protocol
Two network protocols. Transmission Control Protocol is responsible for connection establishment, maintenance, data verification, and relinquishment. Internet Protocol supports the TCP protocol by sending and receiving network datagrams.

U

utility
A program that carries out a specific task, such as copying or deleting files.

V

valid volume
A disk that has been formatted and initialized for use on a workstation or shared resource processor.

value
An element of information supplied in a command form or a configuration file.

variable
A predefined character or group of characters that is replaced with an actual value during program execution.

version number
A number designating the revision level of a software product.

volume
An initialized disk. *See also* valid volume.

volume name
The name assigned to a disk when it is initialized.

VT52 Mode
The text mode that executes DEC private functions (not ANSI).

VT100 Mode
The mode that executes standard ANSI functions to be used with application programs that require strict compatibility with DECs VT100 terminal.

VT100, VT220
The video display terminal that allows you to interact with software applications by executing standard ANSI functions.

VT220 Mode
The mode that executes standard ANSI functions and allows you to use the range of VT220 capabilities. It is to be used with application programs that expect 7–bit or 8–bit controls, and either 7–bit characters or 8–bit multinational characters.

W

workstation
A desktop computer that can function as a standalone system or be connected into a workgroup called a cluster. *See also* cluster.

write access
The ability to open a file and make changes to it.

X

X.25
CCITT standard which defines the protocols for connecting data terminal equipment (DTE) to a public data network (PDN).

XE
See shared resource processor.

XModem
A popular error recovery type protocol for transferring files between computers via serial, asynchronous communications.

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